Dear Colleague:

LIVING COLLECTIONS
Summer, 2002

Enclosed please find sample narratives, schedules of completion, and summary budgets from four successful applications from the 2002 IMLS Conservation Project Support (CPS) grant competition.

The attached samples were selected because they demonstrate how individual institutions with different conservation needs successfully developed projects that address those needs. We feel these narratives are logically and clearly presented, and give sufficient information to support the request.

INSTITUTE *of* MUSEUM *and* LIBRARY SERVICES

This packet contains four samples that represent different types of conservation projects. They emphasize the overall institutional conservation perspective, the involvement of conservation professionals in all phases of the project, and the importance of the project as the highest institutional priority for collections care.

In addition, there are four samples of funded education components. We hope that these samples give you the impetus to partner with your staff educators to develop your own creative way to educate the general public about your conservation project.

The samples included in this packet are listed on the back of this letter.
No endorsement by IMLS of any personnel, conservation facilities, private firms, or conservation procedures and methods identified in the narratives should be assumed.

I hope that these sample narratives will be useful to you as models for structuring a proposal for your conservation needs. IMLS program staff is available at (202) 606-8539 or imlsinfo@imls.gov, and will be happy to discuss any questions you have as you develop your proposal.

The application deadline for the 2003 Conservation Project Support grant program is

October 15, 2002

Applications for CPS are available from the IMLS Web site (http://www.imls.gov), or by calling IMLS at 202-606-8539. We look forward to receiving your application.

Sincerely,

Mary Estelle Kennelly

Mary Estelle Kennelly
Associate Deputy Director, IMLS
Office of Museum Services

Cincinnati Zoo & Botanical Garden

Cincinnati, Ohio

Project Type:	Research (exceptional)
IMLS Award:	$75,000
Match:	$108,076
Total Project:	$183,076
Museum Budget:	$22,946,811

Sample Conservation Projects: Living Collections

Project Type	Museum	State	Award	Match	Project	Budget	Discipline
General Survey	Chicago Botanic Garden	IL	$12,456	$15,029	$27,485	$20,000.507	Botanic Garden.
Environmental Survey	Scott Arboretum	PA	$46,365	$49,827	$73,222	$1,653,220	Arboretum
Research (exceptional)	Chicago Zoo	IL	$75,000	$268,986	$343,986	$43,223,000	Zoo
Research (exceptional)	Cincinnati Zoo & Botanical Garden	OH	$75,000	$108,076	$183,076	$22,946.81	Zoo

Sample Education Components:

Museum	State	Education Award	Total Grant Award
Isabella Stewart Gardner Museum	MA	$10,000	$60,000
L.C. Bates Museum	ME	$3,110	$12,356
Preservation Society of Newport County	RI	$10,000	$58,880
St. Louis Art Museum	MO	$10,000	$23,500

Application Narrative

1. **What is the design of the project?**

The goal of the proposed project is to develop and apply tissue culture propagation and preservation protocols for a group of highly endangered plant species which are in the Center for Plant Conservation's (CPC) National Collection of Endangered Plants (NCEP) and which are experiencing reproductive difficulties. The specific objectives of the project are to: 1) propagate and/or preserve the species using appropriate tissue culture methods at the Cincinnati Zoo and Botanical Garden (CZBG)'s Center for Conservation and Research of Endangered Wildlife (CREW); 2) return propagated material to the CPC garden from which it came; and 3) preserve all tissue culture lines resulting from this project in cryostorage at CREW as a back-up, in accordance with the official CPC/CREW Cooperative Agreement (see Appendix A).

Project Activities

Objective 1. Propagating and Preserving Targeted Species. A group of 33 species (Appendix B) which could benefit from in vitro research and which are in the NCEP has been identified for this project. These include: 1) new species and 2) some previously targeted species. The latter include: a) species for which shoot culture protocols have not yet been established, b) those for which shoot protocols are established but which are not yet rooted, c) species which are not responding to standard procedures, and d) species for which material has not been available. Project activities will focus on applying standard techniques, but for species not responding to these, research will center on the use of experimental procedures, including identifying physiological differences in these taxa which correlate with their response, or lack thereof, in vitro.

Group 1. New species. Each species will be evaluated as to the tissues available for culture and the needs of that particular species. Standard protocols (described below and in more detail in Appendix C) will be used. Specific methods that have been used on related species will be studied (Appendix D) to determine which are most likely to be successful, and work will begin with these. For example, with, *Deeringothamnus pulchellus* and *Spiranthes parksii,* procedures used previously in this lab with *D. rugelii, S. diluvialis* and *S. delitescens* will be tested. Depending on the results, modifications of protocols or the application of new protocols will be made. A variety of approaches are available, as described below, depending on the tissue and the problem involved. This lab has experience in all of these standard in vitro propagation procedures.

Seed germination. For species with some available seed, a portion will be used for in vitro germination, to obtain seedling tissue to establish shoot tip cultures (see below). Five new species from Oregon, *Ivesia rhypara* var. *rhypara, Mentzelia mollis, Mentzelia packardiae, Ririppa subumbellata, Sidalcea oregana* var. *calva,* as well as one from Utah, *Arctomecon humilis,* have low germination rates, and in vitro germination will be used to try to utilize every seed that has potential for germination. In the case of the orchid, *Spiranthes parksii,* work here with two other related endangered species, *S. delitescens* and *S. diluvialis,* has provided protocols for seed germination that will be used. The germination of orchid seeds on nutrient medium in vitro is a standard procedure for orchid propagation, and seedling material be used for shoot multiplication. ***Embryo Germination.*** When dormancy is suspected, embryos will be dissected from the seed for in vitro germination. This strategy has been successful in this lab with several rare species, including *Aster vialis* and *Primula maguerei. **Somatic Embryogenesis.*** In addition to seed germination, immature or mature embryos, or immature leaves or flowers, can be cultured, to stimulate somatic embryogenesis or shoot initiation. This strategy has been used in this lab with *Primula maguerei* and *Calamagrostis porteri* ssp. *insperata. **Shoot Tip Culture.*** Shoot tips from seedlings or from cuttings can be used to initiate shoot cultures. This has been successful in this lab with a number of endangered species, including *Aster vialis* and *Asimina tetramera.* When needed, shoot tips can be taken from plants in the wild using the technique of in vitro collecting (see below), and this has been successful for initiating cultures of *Rhexia aristosa, Lobelia boykinii, Shoenocrambe suffretescens, Aconitum noveboracense, Astragalas cremnophalyx, Deeringothamnus rugelii, Ziziphus celata, Hedeoma todsenii,* and *Clematis socialis. **Young Leaf and Stem Culture.*** Various plant hormones can stimulate young leaf and stem tissues of many species to produce shoot buds. These can then be used to initiate shoot cultures and produce plants, as has been done in this lab with *Trillium pusillum* var. *texanum* and *Deeringothamnus rugelii. **Rooting of Shoots.*** Once shoots are obtained in vitro, they can be rooted on rooting media or as cuttings in sterile soil. ***In Vitro Preservation Procedures.*** For species with short-lived seeds, cryopreservation protocols will be applied to isolated embryo axes in vitro. Previous work in this laboratory has focused on drying and freezing excised embryos of large-seeded temperate trees, and this procedure will be applied to embryos of *Quercus hinckleyii* and *Castanea pumila* var. *ozarkensis.*

Group 2. Previously targeted species. A. Species for which shoot propagation protocols are not yet completed, and B. Species for which shoot cultures have been established but which have not yet been rooted. Work is continuing with some species to which the above standard procedures have been applied. In some cases not much material has been available and shoot cultures are not yet well established. In others, shoot cultures have been initiated, but have not yet been rooted or acclimated due either to recent acquisition of starting material or slow growth of a particular species in vitro. **C. Species for which material has not yet been available.** For *Spiranthes delitescens,* seed has been unavailable, since the plants have not been found over the past several years. This species will be on hold until seed is

available. Similarly, it has been difficult to obtain tissues or seeds from *Pholisma sonorae* or *Ranunculus aestivalis*, but they will be addressed when material is available. **D. Species for which standard procedures have not been adequate.** Some species do not respond to standard protocols. Species in this group fall into three categories: 1) those which are difficult to root; 2) those which show extreme browning in vitro; and 3) those which tend to become hyperhydric in culture. Work in this laboratory is addressing all three of these problems, and has resulted in positive results with several species over the past two years. ***Difficult-to-Root Species.*** When species do not respond to the use of standard rooting protocols using auxin, other approaches are taken. Recent success with the difficult-to-root *Asimina tetramera*, a previously targeted species, was achieved by the use of silver thiosulphate (STS) in the rooting medium. STS inhibits the action of the plant hormone, ethylene, which can inhibit rooting. Cultures of *A. tetramera*, which had not responded to a variety of other treatments over the course of five years of research, have now been successfully rooted on STS, and plants are now being acclimated to soil. Several other species have been difficult to root and similar experiments are underway with these. The possibility that other endogenous hormones are involved in the inability to root is also being explored, using enzyme-linked immunosorbent assay (ELISA), a technique which has been used previously in this lab (e.g. Pence, 1992). If the balance of hormones in the cultures does not appear to favor rooting, procedures aimed at altering the endogenous levels of these hormones, such as liquid medium or the use of other chemical hormone antagonists, will be used. ***Species with Extreme Browning.*** Two species proposed for this project, *Dicerandra immaculata* and *Dicerandra* 'Lake Pierce', are known to have a strong browning reaction to wounding or stress. This represents the oxidation of phenolic compounds, and is normal in many plants, but it can inhibit in vitro growth. Work with a previously targeted species, *Agalinis navasotensis*, has shown that use of antioxidant chemicals, such as ascorbic acid and polyvinylpyrollidone, as well as controlling the size of the original explant, can result in successful establishment of cultures. Work will also focus on using *D. odoratissima* and *D. thinicola*, two more common, related species to test various anti-browning techniques in order to develop protocols for the two targeted species. ***Hyperhydric Species.*** Some taxa readily become "hyerhydric" in vitro, referring to a "glassy"- or "watery" - looking state in stems and leaves of cultured tissues. Current thinking on hyperhydricity centers on the overproduction of endogenous cytokinins in the tissue, but this appears to be influenced by a number of factors, including medium, aeration, and light. Several previously targeted species that were hyperhydric in culture have been significantly normalized by culturing under the higher light intensity in the new CREW plant tissue culture incubator room. These include *Hedeoma todsenii* and *Schoenocrambe suffretescens*. Supporting research on hyperhydricity in this laboratory (not funded by IMLS) has included a large study, currently underway, comparing growth of shoot cultures of nonendangered species collected over the past six months in two arid environments (Utah and Arizona) and two more humid areas (Florida and Ohio). This research was initiated because of observations on the growth of several endangered taxa that suggested that species from drier environments may be more likely to become hyperhydric in culture than those from more humid areas. The results of this study should have direct application to IMLS funded species. It is also thought that plants that are hyperhydric in vitro have higher cytokinin levels and lower abscisic acid (ABA, a hormone involved in stress tolerance) levels than plants of the same species with normal morphology. Work is underway to use the technique of ELISA to measure the cytokinin and ABA levels in these tissues in order to better understand the biology of hyperhydricity and to provide guidelines for modifying endogenous hormone levels in these tissues, thereby reducing the hyperhydricity response.

Other Procedures. ***Acclimating Plants.*** Moving plants from the high humidity of in vitro conditions to soil requires acclimation procedures which may involve media changes and manipulation of light, gases and humidity in the plant's environment. The recent addition of acclimation shelves and lighting in the CREW Plant Lab has improved our ability to successfully transfer plants from test tube to soil. ***Genetic Sampling.*** Sampling is done from as many individuals as are available to represent as much of the genetic diversity of the species as possible. Tissue culture lines and plants generated from these samples are maintained separately. ***In Vitro Collecting.*** For sampling, the technique of *in vitro collecting* (IVC), or initiating tissues in the field, is used when appropriate. IVC has the advantage of utilizing very fresh tissues, of causing minimal disturbance to the plant in situ, and providing an efficient method of transporting samples back to the lab. IVC has been used with a number of previously targeted species, and in many cases has been done by our collaborators, using an IVC kit and instructions sent to them from this lab.

Objective 2. *Return of Plants to the Collaborating Garden.* Once plants are acclimated, they will be returned to the garden from which the starting material came. In some cases, plants may be returned to the garden in vitro for acclimation there in a more suitable habitat. Plants of 10 previously targeted species have thus far been returned to collaborating gardens, with several more being prepared for return.

Objective 3. *Preservation of Tissue Culture Lines.* Several cryopreservation protocols are used in this laboratory. Encapsulation dehydration and encapsulation vitrification have been the most successful, and these are tried first with each tissue line. If survival is not adequate, other procedures, including slow, two-step freezing and vitrification are available in this lab for testing. Tissues of 25 genetic lines of 10 previously targeted species have been banked for long-term storage in liquid nitrogen in CREW's Frozen Garden with several more being propagated for cryopreservation.

Staff. With the support of the IMLS, one full-time Research Assistant will be hired to work on in vitro propagation of the targeted plant species at CREW. Dr. Pence will devote 25% of her time to working with the this person on the design and implementation of protocols for each of the species as well as to measuring hormones with ELISA for this project. In addition, one CREW Research Associate will devote 40% of her time to the cryopreservation aspects of the project. One lab assistant will spend 20% of her time in support work, maintaining the greenhouse and culture collections and volunteer lab assistants will devote 60% of their time to media making and other support procedures. The staff at the collaborating CPC gardens (Appendix B) will be responsible for collecting and shipping plant materials and for providing background information on the species. Dr. Kathryn Kennedy and Mary Yurlina at the CPC will assist in coordinating activities with the gardens, in maintaining the National Collection, and in disseminating information on the CPC website.

Schedule and Products. The number of species proposed here is slightly higher than that included in the previous IMLS proposal because 1) of experience gained in that previous work; 2) two of the new species are congeners of previously targeted species with established procedures; 3) four genera have two species each and 4) three of the species have not been available, but are included should material become available. The availability of material can never be predicted with certainty, since it is affected by weather, disasters (e.g. floods), and the unpredictability of the appearance of particular species from year to year. Some species from previously funded work are included in this proposal, since either plant material has only recently become available, or the species poses particular challenges to tissue culture, as noted above. Based on our previous work, the number of species is appropriate for the schedule of time and the personnel included within this proposal.

The results of these studies will be written into one or more papers for scientific publication in journals such as *In Vitro Cellular and Developmental Biology--Plant; Micropropagation News; Plant Cell Tissue and Organ Culture;* and *Plant Cell Reports,* and will be presented at at least one meeting of the Society for In Vitro Biology. Information will also be disseminated to other CPC gardens through the CPC newsletter and to the CZBG community through its publication, *Wildlife Explorer* and the CREW newsletter, *CREW Review.* (See Appendix E for presentations and publications thus far on IMLS funded work.) An exciting new avenue for dissemination will also be the CPC website, which is being developed as an exhaustive resource for information on endangered plant species in the NCEP (see Appendix F).

2. **What is the object(s), historic structure(s), or specimen(s) that is the focus of the project?**

All of the proposed species are of very limited range. In addition, they have problems in reproduction, or, in a few cases, in germplasm storage, and/or they are in need of assistance in building up their numbers in the NCEP. They represent the 'critical cases' within the CPC National Collection. Specifically, *Spiranthes delitescens* was reduced to only 4 populations but has not been found for the past several years; *Pholisma sonorae* is a sand dune endemic threatened by habitat loss; *Ranunculus aestevilis* is known from only one site, and in 1994 only 4 adult plants were found; *Arctomecon humilis* is know from only one county and seed cannot be germinated; *Deeringothamnus pulchellus, Genistidium dumosum* and *Lupinus aridorum* are rare and set few seeds, and the latter is susceptible to disease in the wild; *Astagalis cremnophylax* var. *cremnophylax* also has low seed set in the wild; *Erythronium propullens* and *Zanthoxylum parvum* have very limited ranges and produce no seed; *Primula maguerei* is found on steep cliffs and is at risk from climbers and road construction, and seed cannot be germinated; *Coryphantha minima* has limited germplasm available for ex situ work; *Asclepias meadii* is a rare prairie species which has suffered from habitat loss, and some populations produce no seed; *Isoetes louisianensis, I. tegetiformans, Dicerandra* species and *Sagittaria fasciculata* are known from only a few sites and require methods for germplasm preservation; *Agalinis navasotensis* is known from only 1 site in the wild; *Aconitum noveboracense* is declining due to habitat degradation; *Ziziphus celata,* known from only 3 sites, requires an increase in numbers to maintain populations as well as for phytochemical testing; *Mespilus canescens* is known from only 1 site with 25 individuals and is slow to propagate in captivity; *Quercus hinckleyii* and *Castanea pumila* var. *ozarkensis* have seeds which cannot be stored long-term, and the latter is susceptible to chestnut blight; *Fryxellia pygmaea* is rare and difficult to propagate; and *Ivesia rhypara var. rhypara, Mentzelia mollis, M. packardiae, Rorippa subumbellata,* and *Sidalcea oregana var. calva* are a group of rare species from the northwest U.S. that are very difficult to germinate.

Each of these is a unique species with importance as part of its natural habitat and of importance as a species for potential utilization by humankind. Species of *Ziziphus* have been used in traditional and western medicine. Biologically active chemicals from species in the Annonaceae, Saxifragaceae, and Papaveraceae have been studied extensively, while species within the Ranunculaceae are also known to produce alkaloids and other biologically active compounds. Members of the Brassicaceae have been shown to contain anti-carcinogenic compounds. Species of the Lamiaceae (mint family) are well known for their volatile oils, flavorings and scents, while members of the Orchidaceae, Asclepiadaceae, Isoetaceae, Liliaceae, Primulaceae, Rosaceae, and Ranunculaceae are horticulturally important as ornamentals. The potential for the usefulness of wild species is not always known, but if these rare taxa are lost, it will be impossible to evaluate what they may have to offer humankind. Many of them are congeners with economically important species (Phillips and Meilleur, 1998) or species used in traditional medicine (Duke, 2002).

Founded in 1984, the CPC is the only organization in the U.S. whose purpose is to prevent the extinction of native plants. The CPC is a consortium of thirty-three botanical gardens and arboreta nationwide that collectively maintain endangered plants in the NCEP, which currently includes more than 450 species, making it one of the largest conservation collections in the world. The CPC's mission is to create a systematic, comprehensive national program of plant conservation, research and education.

The Cincinnati Zoo and Botanical Garden is committed to the understanding and preservation of wildlife and our living world through naturalistic exhibits of animals and plants, scientific research, education, and active cooperation with a worldwide network of conservation organizations. The CZBG is home to the largest botanical garden in the region, which features one of the most extensive collections of perennials, flowering trees and shrubs in the nation. Currently, there are more than 2000 species of plants represented in the CZBG collection.

The CZBG's dedication to conservation science is displayed in its world-renowned research division, CREW. Established in 1981, CREW's mission is to use science and technology to understand, preserve, and propagate endangered flora and fauna and to facilitate the conservation of global biodiversity. The propagation and preservation of endangered plant species is aided through the application of tissue culture propagation, in vitro collecting, and cryopreservation of seeds, embryos, shoot tips, spores, gametophytes, pollen and cell cultures. CREW's Frozen Garden and Frozen Zoo are collections of a wide variety of rare plant and animal germplasm stored in liquid nitrogen, providing a "back-up" of genetic material for future use.

In the true spirit of their missions, the CZBG CREW and the CPC and its member gardens are collaborating to enhance the propagation of highly endangered species in the National Collection of Endangered Plants. The proposed research will not only work to preserve the 33 species listed, but will act as a model for the preservation of other highly endangered plant species. Working in cooperation with 12 botanical gardens geographically dispersed throughout the U.S., the CPC and CREW researchers have targeted these species because of their rarity and uniqueness. The preservation of these species will have both local and national impact as each species is endemic to the habitat in which its participating garden is located and each species is part of the National Collection of Endangered Plants.

3. How does the project relate to your museum's ongoing conservation activities?

A central focus of CREW research is found in its Plant Conservation Division (PCD), which was established in 1986 to adapt the biotechnologies of plant science to the preservation of rare and endangered plants. Over the last 15 years, the PCD has made significant strides in its Endangered Species Propagation Program (ESPP), developing tissue culture techniques for those species that are experiencing reproductive difficulties, as well as developing in vitro collecting and cryopreservation protocols for the collecting and long-term storage of rare species.

PCD researchers were the first to culture various species of *Trillium*, including the rare *Trillium persistens* (Pence and Soukup, 1995). Since then, IMLS-EP funding has supported work on 34 of this country's most endangered species (see Appendix D for summary and more details). *Aster vialis, Sisyrinchium sarmentosum, Calamagrostis porteri* ssp. *insperata, Lobelia boykinii, Rhexia aristosa, Arenaria cumberlandensis, Crotalaria avonensis, Spiranthes deluvialis, Asimiina tetramera; Clematis socialis; Deeringothamnus rugelii, Hedeoma todsenii, Trillium pusillum* var. *texanum;* and *Hedyotis purpurea* var. *montana* have all been successfully propagated in vitro, and the tissues have been or are in the process of being cryopreserved for long-term maintenance in CREW's Frozen Garden. Plants of these species have been or are being returned to the collaborating gardens. Several other species, included in this proposal, are close to being completed: *Aconitum noveboracense, Agalinis navasotensis, Astragalus cremnophylax* var.*cremnophylax, Sagittaria fasciculata, Ziziphus celata.* Work with another target species, *Plantago cordata,* indicated that the seeds, while short-lived in nature, could withstand drying and cryopreservation (Pence and Clark, in revision). They are now being maintained in the Frozen Garden at CREW. Other rare, non-IMLS funded species have been propagated in the lab, including: *Hexastylis shuttleworthii, Ulmus thomasii,* and *Brunfelsia densifolia.*

The species chosen for this work from the National Collection are, by definition, critically endangered. They are also those for which traditional propagation methods have proven unsuccessful or inadequate to meet the conservation needs of the species and they are thus of highest priority for this research.

Other related conservation research in the PCD includes the in vitro propagation and cryopreservation of nonseed plants and the seed banking of species which are regionally threatened. A previous IMS-CP grant enabled the PCD to accelerate the development of optimal long-term storage methods for threatened and endangered plant species native to Ohio. The PCD also supports basic research on the hormonal basis for plant growth in vitro, factors affecting hyperhydricity in vitro, factors affecting browning in vitro, the physiology of desiccation tolerance, critical to seed storage protocols, and the chemical basis of disease resistance, particularly resistance to the chestnut blight which has decimated the American chestnut population. Ongoing work is also directed at improving the technique of in vitro collecting.

7. **How does the project budget support the project goals and objectives?**

The budget for the proposed project was developed based upon a number of factors. The intensive research dedicated to this project requires a full-time Research Assistant. Additionally, the following are included in order to accomplish the goals of this project: A portion of Dr. Pence's time to closely direct the project and to conduct assays; a portion of the time of one PCD Research Associate for cryopreservation work and of lab assistants (salaried and volunteer) for media making, routine transfers, and greenhouse support; a portion of the time of Dr. Mary Yurlina and Dr. Kathryn Kennedy for maintaining the National Collection and coordination of the CPC gardens; and a portion of the time of the collaborating gardens staff for collecting and sending plant material to CREW. In addition, the project requires consumable supplies, including media, hormones, antibiotics, petri plates, culture tubes and caps, antibodies and chemicals for ELISAs, greenhouse supplies, etc. For dissemination of the results of this study, travel to one meeting of the Society for In Vitro Biology are included.

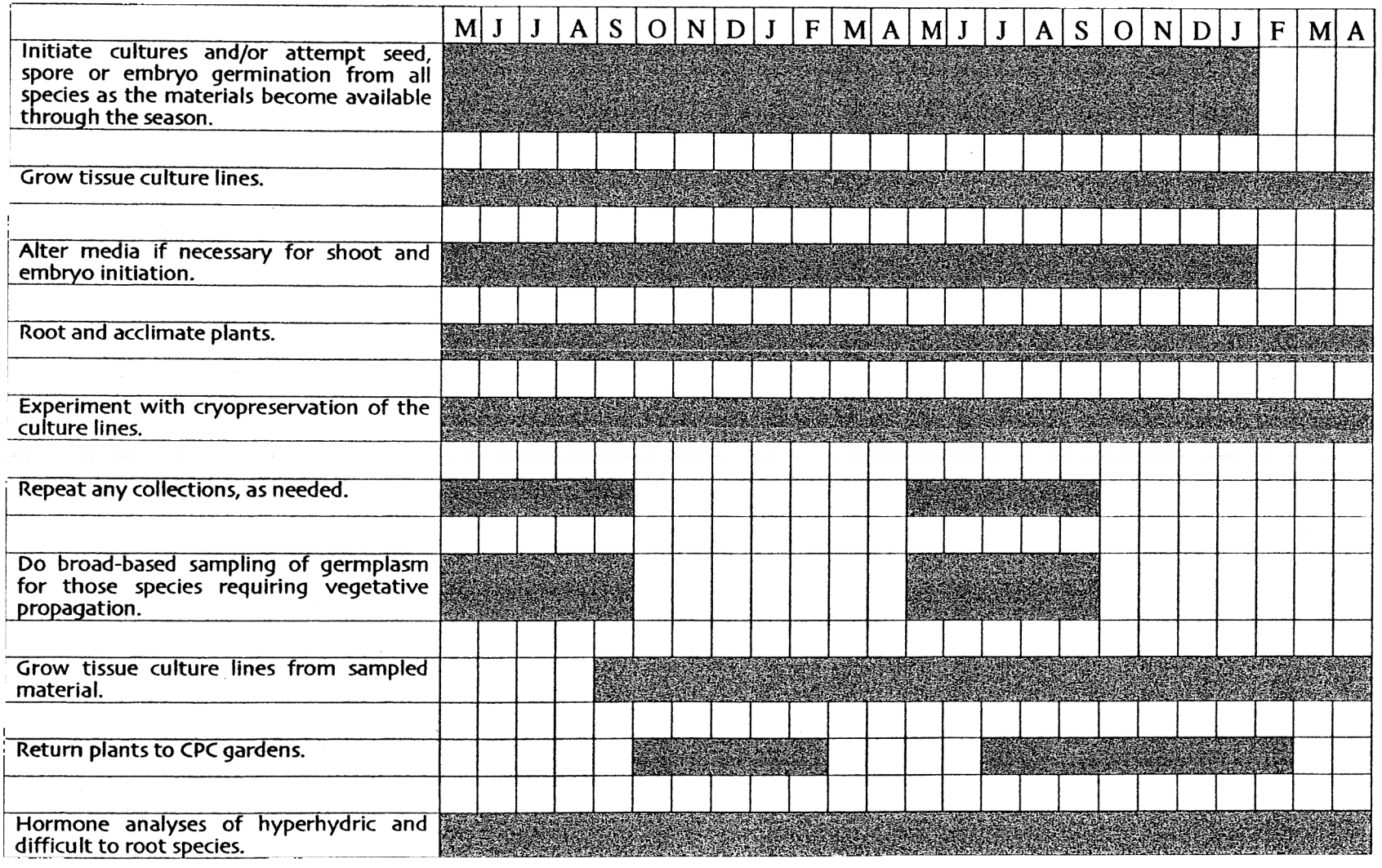
The request to IMLS is for $75,000 which is 36% of the total budget for completion of this project. IMLS funds will be used to underwrite the salary and fringe benefits of a full-time Research Assistant for two years; a portion of Dr. Yurlina's salary; a portion of the garden staff salaries; and a portion of the supplies.

8. **What are the qualifications of the project personnel?**

Valerie C. Pence, Ph.D., Head, Plant Conservation Division, Cincinnati Zoo and Botanical Garden, Center for Conservation and Research of Endangered Wildlife. Dr. Pence earned her Ph.D. in Plant Physiology from Northwestern University and conducted her Postdoctoral research at Purdue University and the University of Florida. As the Head of the Plant Conservation Division of the CZBG CREW since its formation in 1986, she is a leader in the development of technologies for the preservation and propagation of rare and endangered plant species and in the technique of in vitro collecting. All of her doctoral and post-doctoral research has involved in vitro systems. In addition to her position at CREW, Dr. Pence is an Adjunct Research Associate Professor in the Department of Biological Sciences at the University of Cincinnati. As a member of the Scientific Advisory Council of the Center for Plant Conservation (CPC), she provides scientific guidance for the preservation and propagation of the species held as part of the organization's National Collection of Endangered Plants. Dr. Pence will direct the project and work closely with the Research Assistant and other CREW staff to design and modify protocols for each of the species, monitor their progress, and analyze and disseminate the results of this work. **Kathryn Kennedy, Ph.D., President and Executive Director, Center of Plant Conservation, Missouri Botanical Garden.** Dr. Kennedy received her Ph.D. from the University of Nebraska in systematics. She has held a number of positions in the areas of field botany and plant ecology, and has experience with non-profit as well as state and governmental agencies dealing with plant conservation. As the President and Executive Director and former Scientific Advisor of the CPC, she has extensive experience with and knowledge of plant conservation. She is in direct contact with the staffs and collections of the 33 CPC botanical gardens and arboreta throughout the United States, and therefore is well-positioned to form collaborations for the preservation of endangered plant species. Dr. Kennedy will review the results of the research and advise on aspects of the conservation strategies for the species being addressed through this project. **Mary Yurlina, Ph.D., Conservation Programs Manager, Center of Plant Conservation, Missouri Botanical Garden.** Dr. Yurlina earned her Ph.D. from Rutgers University in the area of ecology and evolution. As Conservation Programs Manager at the CPC, she has been responsible for coordinating work and information between the 33 member gardens, managing programs and committees and has worked extensively to upgrade data reporting processes and information availability on the CPC website. Dr. Yurlina will act as a coordinator between CREW and the CPC-gardens and facilitate the dissemination of results on the CPC website. **Full-time Research Assistant, Susan Charls.** Ms. Susan Charls is working on the propagation of the endangered species under the current IMLS funding. Ms. Charls received a B.S. in Biological Sciences from the College of Mount St. Joseph in 1996. Prior to that time she spent 1.5 years as a co-operative education student working in the CREW Plant Lab and has worked as a volunteer in the lab during subsequent summers. As a result, she has gained experience and expertise in several types of tissue culture and in other related techniques. She began work as a Research Assistant in September, 2001. Her responsibilities are centered entirely on the plants included in the IMLS project. If funding is received for the proposed project, it is expected that she will continue in this position. **CREW Research Associate, Bernadette Plair.** Ms. Bernadette Plair, CREW PCD Research Associate will assist with this project with 40% of her time. Ms. Plair has developed significant expertise with a number of cryopreservation procedures and has worked extensively with the cryopreservation of a variety of plant tissues, including IMLS funded taxa. She has also worked with the in vitro collecting project in the PCD. She completed her Masters' Degree from the Department of Biological Sciences at the University of Cincinnati in the summer of 1998. **Laboratory Assistants.** Several workers will fill this position part-time, including one salaried worker and several volunteers who work in the PCD on a regular basis. These LAs routinely make tissue culture media, make routine tissue culture transfers, assist in greenhouse work and wash glassware.

SCHEDULE OF COMPLETION

MAY 2002 – APRIL 2004



Project Budget Form

SECTION 3: SUMMARY BUDGET - CP AND EDUCATION COMPONENT

Name of Applicant _____

IMPORTANT! READ INSTRUCTIONS IN PART 4 BEFORE PROCEEDING.

DIRECT COSTS	IMLS	MATCH	TOTAL
(PERMANENT STAFF) SALARIES AND WAGES	11,405	53,744	65,149
(TEMPORARY STAFF HIRED FOR PROJECT)	48,000	7884	55,884
FRINGE BENEFITS	14,400	20,730	35,130
CONSULTANT FEES			
TRAVEL: DOMESTIC		1300	1300
FOREIGN			
SUPPLIES & MATERIALS	1195	6405	7600
SERVICES			
OTHER			
TOTAL DIRECT COSTS	$ 75,000	$ 90,063	$ 165,063
INDIRECT COSTS*	$	$ 18,013	$ 18,013

* *If you do not have a current Federally negotiated rate, your indirect costs must appear in the Match column only.*

TOTAL PROJECT COSTS		$ 183,076
AMOUNT OF CASH – MATCH	$ 90,063	
AMOUNT OF IN-KIND CONTRIBUTIONS – MATCH	$ 18,013	
TOTAL AMOUNT OF MATCH (CASH AND IN-KIND CONTRIBUTIONS)		$ 108,076
AMOUNT REQUESTED FROM IMLS		$ 75,000
PERCENTAGE OF TOTAL PROJECT COSTS REQUESTED FROM IMLS (MAY NOT EXCEED 50%)		41 %

Have you received or requested funds for any of these project activities from another Federal agency? *(please check one)* ☐ Yes ☑ No

If yes, name of agency _____ Date _____

Amount requested $ _____

Chicago Zoo
Brookfield, Illinois

Project Type:	Research (exceptional)
IMLS Award:	$75,000
Match:	$268,986
Total Project:	$343,986
Museum Budget:	$43,223,000

Sample Conservation Projects: Living Collections

Project Type	Museum	State	Award	Match	Project	Budget	Discipline
General Survey	Chicago Botanic Garden	IL	$12,456	$15,029	$27,485	$20,000,507	Botanic Garden.
Environmental Survey	Scott Arboretum	PA	$46,365	$49,827	$73,222	$1,653,220	Arboretum
Research (exceptional)	Chicago Zoo	IL	$75,000	$268,986	$343,986	$43,223,000	Zoo
Research (exceptional)	Cincinnati Zoo & Botanical Garden	OH	$75,000	$108,076	$183,076	$22,946,81	Zoo

Sample Education Components:

Museum	State	Education Award	Total Grant Award
Isabella Stewart Gardner Museum	MA	$10,000	$60,000
L.C. Bates Museum	ME	$3,110	$12,356
Preservation Society of Newport County	RI	$10,000	$58,880
St. Louis Art Museum	MO	$10,000	$23,500

Experimental Tests of the Effects of Captive Breeding of Wildlife

1. WHAT IS THE DESIGN OF THE PROJECT?

Small populations of wildlife are at risk, and the threats to viability are no less to captive populations than to remnant, isolated wild populations [1]. They potentially suffer from effects of inbreeding [2]; they can lose the genetic diversity that is necessary to allow adaptive response to environmental changes [3]; and they can adapt to specific, short-term environmental change and be left without adequate flexibility to cope with further changes or even restoration of the original conditions [4, 5]. They can also be subjected to random genetic changes that result in non-adaptive evolution and accumulation of deleterious traits in the population [6].

To counter these processes, zoos intensively manage their breeding programs, determining from pedigree analyses which animals should be bred and to which mates [7, 5, 8]. However, these recommendations are based on fundamental assumptions that have not yet been adequately tested. The first is that the rate of loss of genetic diversity in important traits will be similar to the rate of loss in the non-selected genes that we model in our theoretical calculations. A second assumption is that the amount of genetic decay that we tolerate in our captive populations is appropriate – neither more than is necessary to secure the future of the populations, nor less than what could be accommodated by the populations without incurring unacceptable risk. A third assumption of present management techniques is that the biggest genetic threat that must be countered is the random loss of diversity that occurs when only a few animals are breeding, rather than rapid adaptation to the specific conditions of captivity concurrent with the loss of adaptations necessary to survive in the wild [9]. If these assumptions are wrong, then zoo species management programs may be ineffective, possibly unnecessary, and conceivably harmful to the goals of preserving healthy, genetically diverse populations of wildlife.

Some studies have addressed aspects of the above issues. Analyses of zoo pedigrees [10, 2, 11-13] have shown that inbreeding can cause declines in viability. Studies on *Drosophila* have indicated that zoo breeding strategies can result in the genetic benefits we expect [14, 15], but the effects of selection may be stronger than had been presumed [16]. Yet studies of houseflies [17, 18] suggest that sometimes strategies we eschew (e.g., severe reductions in population size) can result in increased variation. We have found that inbreeding of *Peromyscus* mice impacts many aspects of fitness [19-23], and that even small effects in captivity can translate to large effects when the animals are reintroduced to natural habitats [24]. Also in the zoo's lab, Margulis [25-27] found that genetic changes can impact parental care behaviors, and Ryan [28] found that mate choice is influenced by kinship and can significantly change reproductive success [23]. At this time, a graduate student is testing the effects of captive breeding on predator avoidance behavior by *Peromyscus.* Lacy and Horner [29] found that generations in captivity and inbreeding independently led to changes in skull shape in *Rattus villosissimus.* Although of considerable value, the above studies do not yet provide us with assurance that zoo breeding programs will be successful. None of the lab studies has fully modeled the breeding designs that zoos follow and, with the exception of work at Brookfield Zoo, the tests of captive breeding designs were all conducted on invertebrates.

Although the primary focus of population management of captive animals has been on maintaining adequate genetic variation, changes also occur in physiology, behavior, and morphology. There is evidence that breeding strategies may modify stress responses [30, 31]. Stress-susceptible individuals may be more likely to develop health problems [32, 31], exhibit depressed immune responses [33, 34], and show compromised reproduction [35, 36]. Genetic changes could alter stress reactivity and may limit potential for reintroduction [37, 38]. Factors that allow some individuals to breed in captivity may be harmful in natural environments. For example, the diets fed to captive animals can lead to changes that may compromise fitness if the animals are ever again faced with the challenges of more constrained diets in the wild or in captivity. Abnormal growth rates, changed body composition, and reduced efficiency converting food to body tissues may be undesired consequences of high-quality, high-volume diets [39-41].

Purpose and specific goals

Recognizing the need for assessment and research on the effects of our captive breeding programs, in 1997 Brookfield Zoo staff (with support from the Phoenix Zoo) organized a "**Workshop on the Effects of Generations of Captivity on the Viability of Wildlife**," at which 34 colleagues from zoos, universities, governmental agencies, and conservation organizations reviewed our knowledge and the need for further information. Participants at that workshop identified a need for an interdisciplinary research program using a species such as *Peromyscus leucopus* as a model. The plan for this Conservation Project arose largely from that workshop and follows the recommendations of the 34 participants.

In this project, we will establish **an experimental model of zoo captive breeding programs**. *Peromyscus leucopus* mouse populations, newly derived from a wild population, will be monitored for effects seen in captive populations. Replicate stocks will be established so that repeatable trends can be distinguished from random variation among lines. Populations managed in the same way that we manage the breeding programs for American Zoo and Aquarium Association (AZA) Species Survival Plan (SSP) species will be compared to stocks maintained under random breeding and an alternative genetic management strategy. We will study these populations for at least 8 generations of captive breeding, in order to provide a good model of the changes that occur over 25 to 100 years for the typically long-lived species that are the focus of most breeding programs within zoos.

The populations will be monitored for changes in genetic variation at neutral loci and at functional protein-coding loci and for changes in the components of quantitative genetic variation in behavioral and morphological traits. We will monitor

adrenal hormones using fecal steroid analyses and thus measure responses to stressors over time in captivity and across generations. We will also monitor changes in body composition and efficiency of feed conversion. The components of our integrated study of the effects of captivity will include **measurement of changes through generations in captivity** of:

- **Reproductive success**, as measured by litter production, litter size, and infant mortality
- Infant **growth rate**, body **size at weaning**, and **adult body size**
- **Body composition**, including protein, fat, minerals, specific vitamins, amino acids, fatty acids, and contaminants
- **Food consumption** and **feed conversion** (gain of body tissues relative to intake)
- Glucocorticoid metabolites, as a measure of **stress hormone levels**
- **Docility** of animals when handled, and **aggression** of animals towards cagemates
- **DNA variation** at highly polymorphic "microsatellite" and "minisatellite" loci, and relatedness among founders
- **Variation at functional loci** that code for important proteins
- **Quantitative genetic variation** in body size, docility and aggression, and reproductive performance

Examination of the interactions among the above variables will be as valuable as the independent studies themselves, and the comprehensive, integrative nature of this study sets it apart from all prior work on the topic.

We have initiated this study with start-up funds from the AZA Conservation Endowment Fund. The AZA grant provides partial support for the establishment of the experimental population, the validation of hormone and molecular genetic methods, and data collection on wild-caught founders and the first three generations of captive animals. We are now seeking IMLS support to continue this study through 8 generations of captive animals, starting with the production of the third generation in July 2002, and ending with the completion of analyses through the eighth generation in June 2004.

Methodology

Breeding program. In order to study the effects of captivity, we need a model experimental system that allows rapid collection of data on multiple populations over multiple generations. The founder stock for this project are 20 *Peromyscus leucopus* mice out of 45 that were captured October 2001, in the Volo Bog State Natural Area in Lake Co., IL. The mice are being quarantined until confirmed to be free of disease, after which they will be paired at random. We will select 10 of the successfully breeding pairs to serve as founders. Two progeny from each pair will represent their founder line in each of the six experimental populations. Two replicate populations will be bred according to each of three treatments: (1) **SSP-style management**; (2) **random breeding**; and (3) **selection for docility**. In the **SSP-style management** treatment, pairings will be determined by mean kinships (the average overlap of an individual's alleles, due to common ancestry, with the population as a whole), difference between partners in mean kinship, and inbreeding. These three components of a genetic assessment are those that are used currently to guide SSP programs [7, 5, 8]. In the **random breeding** treatment, a computer program will be used to select pairs at random from among the females and males available each generation. All mice will be scored for tendency to jump out of the cage, tendency to bite the glove of the technician, and aggression toward cagemates (tail bites). Each of these is easily observed, but tests are underway to confirm that they can be reliably scored. Mice with the lowest combined scores will be breeders in the **docility selection** treatment.

Each population will be maintained with 40 pairs per generation and 3 generations per year. Each pair will produce up to two litters over 63 days. Reproductive data (breeding, days to first litter, interbirth interval, litter size, survival to weaning, mass at weaning) will be recorded. After weaning at 20 days of age, mice will be housed as groups of three same-sex cagemates. The docility score and body mass will be recorded at 40 days of age. Throughout the study, animals will be sacrificed with CO_2, following protocols already approved by the Institutional Animal Care and Use Committee (IACUC). Tissues will be saved for molecular analysis, and carcasses will be saved so that they are available for further studies. Annually, in October, a 5-day capture study will be conducted on the wild population. This will provide estimates of population size, ear punch tissues for molecular genetic analysis, and an opportunity to collect more wild-caught mice.

The breeding program requires one full-time lab technician and a 40% part-time technician to provide appropriate care for and maintenance of the colony seven days per week, and to collect samples and breeding data. The Population Geneticist will dedicate 20% of his time to supervising animal care, designing breeding plans, overseeing field collections, and doing the statistical analyses on reproduction, survival, body weight, and quantitative genetics.

Genetic Analysis. We need to **monitor losses of both neutral (non-adaptive) variation and adaptively important variation**. Variation at 10 microsatellite DNA loci will be monitored in each experimental population each generation, and in 40 samples from the wild population each year, for a total of 400 mice each year. DNA will be extracted from tissue samples obtained from the ear punches that are used to identify individuals. Primers that amplify variable microsatellites in this species are available to us from Oliver Pergams at the University of Illinois. Microsatellite alleles will be analyzed on an automated capillary sequencer and genotyper. Variation at minisatellite loci ("DNA fingerprints") will be assayed using two hypervariable chemiluminescent labeled probes. Variation at two functional loci, serum transferrin and serum albumin, will be determined using standard allozyme and DNA methods [42, 43]. These assays and analyses will require 30% effort of a genetics lab research associate and 20% of the Molecular Geneticist's time throughout the project period. Maximum-likelihood techniques [44, 45] will be used to estimate variance components (additive genetic variance, dominance variance, epistatic variance, and residual environmental variance) for body size and docility.

Adrenal Hormone Analysis. We will determine **how animals respond hormonally to the stress of captivity**. Adrenal activity will be measured using fecal corticoid metabolite analyses. Glucocorticoid level in the blood is well known as an indicator of stress in mammals and birds [46, 47]. More recently fecal corticoid monitoring has gained popularity due to its non-invasive collection. Fecal glucocorticoid metabolite analysis using radioimmunoassay (RIA) techniques has already been established for *Peromyscus* [48]. In fall 2001, we will validate an equivalent enzymeimmunoassay (EIA) due to the ease of use and lower cost of EIA analyses. We will also conduct an ACTH challenge on 6 additional mice for assay validation. We collected fecal samples from all wild-caught animals at the time of capture. By checking traps every 4 hours, we were able to collect samples containing corticoid metabolites that reflect the hormones that were circulating before the mice were captured. Thus, we will soon have a baseline measure of stress hormones for the wild population.

We are collecting samples twice weekly from all captive stock during quarantine, in order to monitor short-term adjustment to captivity. In each subsequent generation, we will collect fecal samples from 10 mice in each population, weekly from weaning through 6 months of age (25 samples per mouse). Samples are being collected at the same time of day and are being stored frozen until analysis. Each year, we will also collect fecal samples from 40 additional wild-caught animals in the source population. Prior to the start of the IMLS-funded work, we will have analyzed all samples collected from ACTH challenge individuals, and all samples collected during the initial capture event, during quarantine, and during another few months until the establishment of treatment groups. This will provide assay validation and enable us to study initial variation in stress responses among founder individuals, as well as physiological adaptation to the captive environment. We will analyze samples from the third and subsequent generations produced during this IMLS Conservation Project. Analyses are being conducted at Brookfield Zoo's Endocrine Lab. This will require 30% effort of the Endocrine Lab Technician and 5% effort of the Behavioral Endocrinologist throughout the project period.

Nutritional Assessment. The **effects on body composition and feed utilization of the high-quality captive diet** will be monitored. The principal index of nutritional status has been body fat (or energy) stores, although a number of papers include analyses for other substances [49-53]. We will measure whole body composition (protein, fat, energy, minerals, and contaminants) and tissue levels of selected amino acids, fatty acids and lipids, vitamins, and minerals. Crude protein will be determined using the Kjeldahl method, crude fat will be determined by Soxhlet ether extraction, and energy by bomb calorimetry [54-56]. Minerals will be analyzed by ICP Spectrophotometry. Comparisons among wild, early captive generation, and later captive generation mice will **help us to interpret observed deviations in such measures among zoo animals and values collected from free-ranging animals**. Adult males not needed for breeding will be used, in order to control the variables of age, sex, and reproductive stage. Ten adult male mice were sacrificed at the initial catch, and they will provide a baseline of the body composition of mice in the wild. Upon later sacrificing other wild-caught mice, we will measure body composition in order to determine what changes occurred in the wild-born mice as a result of living in captivity. In each subsequent generation, we will analyze 20 individually housed adult male mice to evaluate changes that occur through the generations. Animals will be weighed before and after a 5 day period during which food offered and food consumed will be measured daily. Feed conversion will then be determined from food intake and body weight [57, 58]. This will require 60 hours of Staff Nutritionist time, and 5% effort by the Director of Nutrition Services.

Dissemination of results. Papers reporting our findings will be submitted to *Zoo Biology*, *Animal Conservation*, and other journals. Results will be presented at annual meetings of AZA, its advisory committees, and scientific societies, such as the Society for Conservation Biology. Any results that indicate a need for changes to breeding strategies will be brought to AZA committees (such as the Small Population Management Advisory Group) for discussion and action.

2. WHAT ARE THE OBJECTS, HISTORIC STRUCTURES, OR SPECIMENS THAT IS THE FOCUS?

The focus of this project is truly all of the captive populations of wildlife that are under scientific and collective management of AZA conservation programs – the more than 100 Species Survival Plan species and more than 170 Population Management Plan species. In this project, we will use an experimental population of *Peromyscus leucopus* (white-footed mice) to model the effects of maintaining wildlife populations for multiple generations in captivity using the population management methods that currently guide all of the conservation programs of the AZA. We will study these effects in 6 populations of 40 pairs over 8 generations.

3. HOW DOES THE PROJECT RELATE TO YOUR MUSEUM'S ONGOING CONSERVATION ACTIVITIES?

Brookfield Zoo's broad commitment to conservation is evidenced by an active program of breeding endangered species; leadership in Species Survival Plans (SSP); teaching in AZA schools for professional development; development of the computer software that guide breeding programs; and research in population biology, genetics, behavior, reproduction, nutrition, and *in situ* conservation programs. Thirty endangered species are managed at the Zoo, four curators are SSP coordinators, and the Zoo publishes nine studbooks. The Zoo has received ten IMLS Conservation Project grants.

Zoos worldwide share concerns over the rapid decline of species in the wild, and zoos potentially play a significant role in ensuring the preservation of these species through captive breeding. As a conservation institution, it is a high priority for Brookfield Zoo to support SSP programs through successful captive breeding, and through the advancement of the science of population management. This project will help us clarify how (and how well) zoo breeding programs impact the well-being and future of captive populations, and potentially the future of entire threatened species.

Brookfield Zoo has been an international leader in population management. Research directed at providing the **knowledge and techniques for managing successful breeding programs** has been supported by IMLS Conservation Project grants, AZA Conservation Endowment Fund grants, NSF research grants, grants from the MacArthur and Rice Foundations, and substantial ongoing support through the annual operating budget of Chicago Zoological Society. Our **pioneering research on the effects of inbreeding on populations** of *Peromyscus* mice has provided detailed data on the effects of inbreeding [19], the predictability and determinants of the effects [59, 20], the potential for managing those effects [21], and the implications for survival of captive born wildlife that are released back into the wild [24, 2]. The Zoo has supported its Population Geneticist, Dr. Robert Lacy, in the **development of the GENES software used to guide the genetic management of zoo breeding programs since 1987** and the new **PM2000 software that now guides the genetic and demographic management of all captive breeding programs of zoos**. The Zoo has supported its staff as teachers in the AZA Population Management course and other professional courses. We developed and hosted the first course for zoo professionals on Advanced Population Management, and we continue to support the course on a biannual basis with the Fort Worth Zoo and National Zoo. Brookfield Zoo is co-host with Lincoln Park Zoo of the AZA's Population Management Center, through which we provide expertise to the AZA's breeding programs. The Zoo supports Dr. Lacy as the chair of the Science and Technology Advisory Committee of the International Species Information System (ISIS), and in June 2001, the Zoo organized and hosted an international meeting on "Developing better animal information systems." The Zoo continues to work to improve population management through service of its staff on AZA committees.

The Zoo's **Genetics Lab**, with support over the years from IMLS, the AZA, and the Zoo's operating budget, **provides services** such as **sex determination** of birds, **taxonomic identification** of New World primates [60, 61], **paternity determination** of group-living species such as dolphins, penguins, and gorillas, and **assessment of genetic diversity and viability of captive and wild populations**. In 2000, the Zoo formalized a Behavioral Husbandry Research Program and hired a Behavioral Research Manager to work with staff to conduct research in order to improve on the behavioral health of our captive populations. In 2001, the Zoo hired a Behavioral Endocrinologist and established an **Endocrine Lab**, where urinary and fecal enzymeimmunoassay (EIA) analyses are used non-invasively to **monitor hormone metabolite concentrations pertaining to reproduction and stress** in our captive populations of wildlife. Since the early 1980s, the Zoo has supported **nutrition research and advisory services**. One of only four such labs in the USA, the **Nutrition Lab** provides chemical analyses of food, conducts quality control analyses on samples to ensure good diets and collaborates in research programs with a variety of universities and other zoos as well as providing training opportunities for students.

4. WHAT ARE THE ANTICIPATED BENEFITS OF THIS PROJECT?

This will be the most significant study of the **multiple, interacting effects on wildlife of the captive breeding programs followed by zoos**. This study will **document impacts** of the currently preferred breeding strategy through publications and presentations, **provide guidance** to the AZA and to zoos internationally about how to monitor populations for undesired changes, **be a resource** to other researchers for diverse complementary studies, and **provide a basis for future** comparisons of proposed breeding strategies. The AZA's Small Population Management Advisory Group, the committee that advises zoos and the AZA on management of captive populations, rated this project their highest priority for funding this year (see attached letter). Because of the far-reaching consequences of this project, we are asking for IMLS support as an Exceptional Project. The benefits clearly serve the entire zoo community, not just Brookfield Zoo.

There has been a debate as to whether captive populations can serve as adequate long-term safeguards against species extinction and whether it is appropriate to release into the wild animals that descend from many generations in captivity [62, 63]. There is also a growing concern that zoo populations may not be secure [1]. With the increasing number of species coming under management, it is imperative that we determine how well zoo breeding programs are succeeding. If zoos are failing to meet their genetic goals, then we need to adjust our strategies before we lose the ability to obtain new founders from the wild. Even if zoos are maintaining genetic diversity at levels that have been presumed to be adequate, morphological, behavioral, and physiological changes may be occurring that would jeopardize that long-term persistence and conservation value of the populations. On the other hand, if zoos are maintaining genetically, physiologically, and behaviorally healthy captive populations, then we need to document that success to the public, to governmental agencies, to conservation organizations, and to zoos. The AZA recently mandated full compliance with the breeding programs that fall under its SSPs, so we need to document the benefits derived from those programs. Taxon Advisory Groups (TAGs) now determine what level of management is appropriate for each species. To guide these decisions, we need to know what benefits are gained from intensive management.

Specific benefits arising from this project include:

- Documentation that randomly sampled DNA variation is depleted at the rates predicted from pedigree analyses
- Quantification of the reduced rate of loss of genetic variation achieved through SSP-style management
- Assessment of the rate of loss of adaptive variation in morphological and behavioral traits
- Documentation of the extent to which genetic management maintains reproductive performance and fitness
- Assessment of the changing levels of stress as animals are captured from the wild, acclimated to captivity, and then possibly adapted through generations of captive breeding
- Documentation of effects of artificial diets on food consumption, feed conversion, body composition, and growth

The **direct applications** of the project to captive breeding programs will depend on what results are obtained, but the findings could lead to substantial changes in management techniques, resources expended, and conservation successes. Possible impacts of the project include:

- Recommendation that SSPs maintain larger populations than they do now, to protect adequate adaptive variation
- Recommendation that animals be used for reintroductions only if they have been in captivity for few generations
- Recommendation that captive populations be monitored for stress hormones, or DNA variation, or other variables
- Identification that the advantages of a rigorously controlled breeding program is sufficiently small that zoos could relax their insistence on using only the most genetically valuable breeders in SSPs
- Identification that without careful breeding, components of population health are compromised excessively, so that zoos should move more rapidly to scientific management of breeding for all captive populations
- In the best case scenario, confirmation that zoo breeding programs are already right on track, so that zoos can more confidently recommend that captive populations are indeed suitable for reintroduction efforts

In addition to these benefits from the core research program, the experimental stocks developed through generations of breeding will be available for further studies on the effects on behavior, energetics, reproductive physiology, animal health, and any other possible consequence of captive breeding. All carcasses will be saved for possible later analysis, and the living stocks will be available for studies by additional future collaborators. Because we can study and monitor the wild population from which the founder animals were obtained, it will be possible to compare later captive generations to the most appropriate control population. The data generated by this project will also provide a baseline for future testing of alternative breeding programs – perhaps incorporating population subdivision, more diverse environments, behavioral enrichment, less intense management, selection for desired traits, or use of molecular markers for guiding breeding.

Brookfield Zoo has been committed to advancing the science of the management of small populations since the creation of its Conservation Biology Department in 1985. The Population Genetics and Molecular Genetics research programs have always focused as much or more on service to the broader zoo community than on purely basic research or on work that benefits primarily Brookfield Zoo. The Molecular Lab provides free services to 158 zoos and aquariums by sexing birds, determining paternities, and resolving taxonomic identities. The Population Genetics program developed current zoo pedigree analysis methods, wrote the software to implement those methods, teaches the techniques of scientific management of captive populations, and supports application of these techniques through the AZA Population Management Center. The commitment of the Brookfield Zoo to these two largely service programs is demonstrated in the more than $3,000,000 of support provided from operating funds and raised grant income over the past 15 years. This project continues that commitment, with the initiation of the next major phase of our research.

5. HOW WILL THE APPLICANT ENSURE THAT ONGOING MUSEUM FUNCTIONS ARE NOT INHIBITED?

All facilities and research staff required for this project are already in place, and do not overlap with facilities and personnel that are committed to the care of exhibit animals. The breeding studies will be conducted in a **separate animal facility for population biology research**, adequate to maintain up to 3,200 mice. Other research projects in this facility were completed in 2001, and the facility is now solely dedicated to this project through the next few years. The facility has caging, cage washing equipment, balances, and freezers. It meets NIH/PHS guidelines for research animal facilities. Hormonal assays will be conducted by a research technician in the Endocrine Lab, under the supervision of the Behavioral Endocrinologist. Molecular genetic assays will be conducted by a technician in the Genetics Lab, under the supervision of the Molecular Geneticist. The Molecular Genetics lab is equipped with PCR thermal cyclers, an automated sequencer, and all other equipment needed. Body composition will be measured by Zoo Nutrition Services staff.

6. WHAT ARE THE PROPOSED CONSERVATION METHODS AND WHY ARE THEY CONSERVATIONALLY SOUND?

This project will be **the first definitive test** of the effectiveness of the breeding strategy now used to ensure survival of captive populations of wildlife. We will determine the relatedness among founders, the rate of loss of variation at microsatellite and minisatellite DNA loci, the change in components of genetic variation that determine adaptive flexibility of traits, the rate of domestication, the impact of the captive environment on adrenal (stress) hormones, changes in digestive efficiency and body composition, and changes in reproductive performance. The pedigree analysis and management methods will be those used currently by all collaborative programs for captive breeding. The populations managed with these methods will be contrasted to populations that are randomly bred, selected for docility (as likely happens inadvertently in zoos when breeding programs are not designed to prevent it), and the source wild population.

The molecular genetic assays are those that are widely recommended [64-67] and are increasingly used to monitor changes in genetic variation of captive and wild populations. The quantitative genetic analyses of morphological traits are those that have been developed for domesticated animal breeding and have been applied to wild populations [68-70, 44, 45]. The hormone analyses used to monitor stress responses in wildlife have been developed very recently and are now being applied to a wide variety of free-ranging and captive-held species [48, 71-78]. The methods for monitoring digestive efficiency and body composition are utilized commonly in domestic animal nutrition. Additionally, body composition has been used to reflect health and nutritional status of free-ranging animals. Combining these data will provide a clear picture of the animals' nutritional status and how changes in diet and intake in a captive environment may affect that status.

Peromyscus leucopus is an ideal model organism for this study because it is easy to manage in a laboratory facility, it can produce three generations per year, and more is known about its ecology, behavior, and genetics than any other native animal species in North America [79, 80]. At Brookfield Zoo, we have 16 years of experience using *Peromyscus* as models to study the effects of inbreeding and outbreeding on captive populations. The number of founders (20) and the size of our experimental breeding populations (40 breeding pairs) are typical of many of the SSP populations collectively managed by AZA zoos. The scale of this breeding program is very similar to prior studies conducted by us in the facility. The planned sample sizes have been adequate but not excessive for demonstrating statistically significant differences in reproductive performance among species, subspecies, lineages, and levels of inbreeding. The samples sizes for DNA assays, nutritional assessment, and hormone analyses are the minimums that will allow robust statistical analyses. The research methods and protocols have been reviewed and approved by the Zoo's IACUC.

7. HOW DOES THE PROJECT BUDGET SUPPORT THE PROJECT GOALS AND OBJECTIVES?

Because this project will not benefit any individual zoo uniquely, but will benefit all AZA zoos and their cooperatively managed species, we request consideration of this proposal as an Exceptional Project. Brookfield Zoo requests $75,000 in Conservation Project Support from IMLS for two years of this study. Funding to initiate the project has already been obtained from the AZA's Conservation Endowment Fund ($42,926 to support establishment of the experimental populations and data collection on the first three generations) and the Chicago Zoological Society. The value of the project will grow with each generation, as we gain understanding of the cumulative effects on wildlife of maintaining the populations in captivity. Funding from IMLS is requested to allow continuation of the project through mid 2004, by which time data will have been collected on eight generations in captivity. IMLS funds will be used to pay for lab supplies for analyses of DNA, stress hormones, and body composition, and the costs of food, bedding, caging, and other animal care supplies, and for partial support of the wages for the research technicians needed to conduct these three kinds of analyses, provide animal care, and maintain breeding records. The Zoo will provide as matching funds the balance of research technician wages, all senior scientist salaries, and all fringe benefits and indirect costs, totaling $268,986.

The project budget was developed based on experience using this type of colony, and doing similar hormonal and nutritional analyses, in past research. To maintain an animal colony of required size (720 experimental pairs per year; about 3,000 mice produced per year; about 1,000 living mice at any one time) requires, at the absolute minimum, 1.4 full-time equivalent lab technicians in order to provide animal care 365 days a year. This includes one supervisory technician to manage the animal facility and a part-time technician to assist in animal care. Costs for food, bedding, and scheduled cage replacement reflect average quantities for past research of this scale at Brookfield Zoo. A 30% time technician is required for the molecular genetic analyses and a 30% time technician is required for assays of stress hormones; 60 hours of Staff Nutritionist time is required to oversee the nutritional assessments. Molecular genetic lab costs are based on assays of 400 mice per year (20 mice per generation x 6 treatment replicates x 3 generations, plus 40 wild-caught mice). Annual costs for endocrine analyses are based on $3/sample x 180 mice annually x 25 samples/mouse, plus $3 x 40 samples from wild mice annually. Costs for nutritional assessments are based on standard outside lab costs for five separate body composition assays each for six generations and two additional wild-caught samples.

8. WHAT ARE THE QUALIFICATIONS AND RESPONSIBILITIES OF THE PROJECT PERSONNEL?

- Population Geneticist, **Dr. Robert Lacy**, will oversee field collections, design the breeding plans, supervise animal care, and do the statistical analyses on reproduction, survival, body weight, and quantitative genetics. He has extensive experience in all of these areas, and he has used mice for tests of inbreeding and outbreeding since 1975. He developed many of the methods and the software used by zoos for pedigree analysis and management. Animal care technicians **Glen Alaks** and **Allison Walsh** have together 23 years of experience with *Peromyscus* mice, and each is certified as a Laboratory Animal Technician by the American Association of Laboratory Animal Science.
- Molecular Geneticist **Dr. Jean Dubach** will oversee the analyses of DNA variation. She already provides extensive molecular genetic analyses (of sex, species, and pedigrees) to serve AZA programs. Her Ph.D. research was on local genetic adaptation of *Peromyscus* mice [81]. The lab assistant, **James Norton**, has experience with DNA analyses of wild and captive populations of tapirs, and experience with various other species related to the zoo's service work.
- Behavioral Endocrinologist **Dr. Nadja Wielebnowski** will oversee hormone assays. For 10 years she has investigated effects of captive management on behavior and hormones of felids, using fecal steroid analysis for 8 years. Her lab technician, **Astrid Bellem**, holds a B.S. degree in Biology and has had 15 years of experience in hormone assay development and analyses for monitoring hormones. She has already biochemically validated a corticosterone EIA assay for monitoring adrenal activity in *Peromyscus* (the planned ACTH challenge will provide the biological validation of this assay) and is currently refining extraction and assay techniques for processing *Peromyscus* fecal samples.
- Staff Nutritionist and Nutrition Lab Manager, **Kerri Slifka**, will conduct the studies of body composition and feed conversion. She has a MS in nutrition with 5 of her 15 years of zoo nutrition experience involved with conducting nutritional analyses. Director of Zoo Nutrition Services, **Dr. Susan Crissey** will be providing guidance on research design and nutrition analyses. For the past 7 years much of her research has focused on nutritional status of captive animals. Additionally, she has published on body composition of domestic mice [50].

Attachment 3 in Supporting Documents contains some papers that represent Brookfield Zoo's extensive research with *Peromyscus*, on population management issues, and on the techniques of molecular, hormonal, and nutritional analyses.

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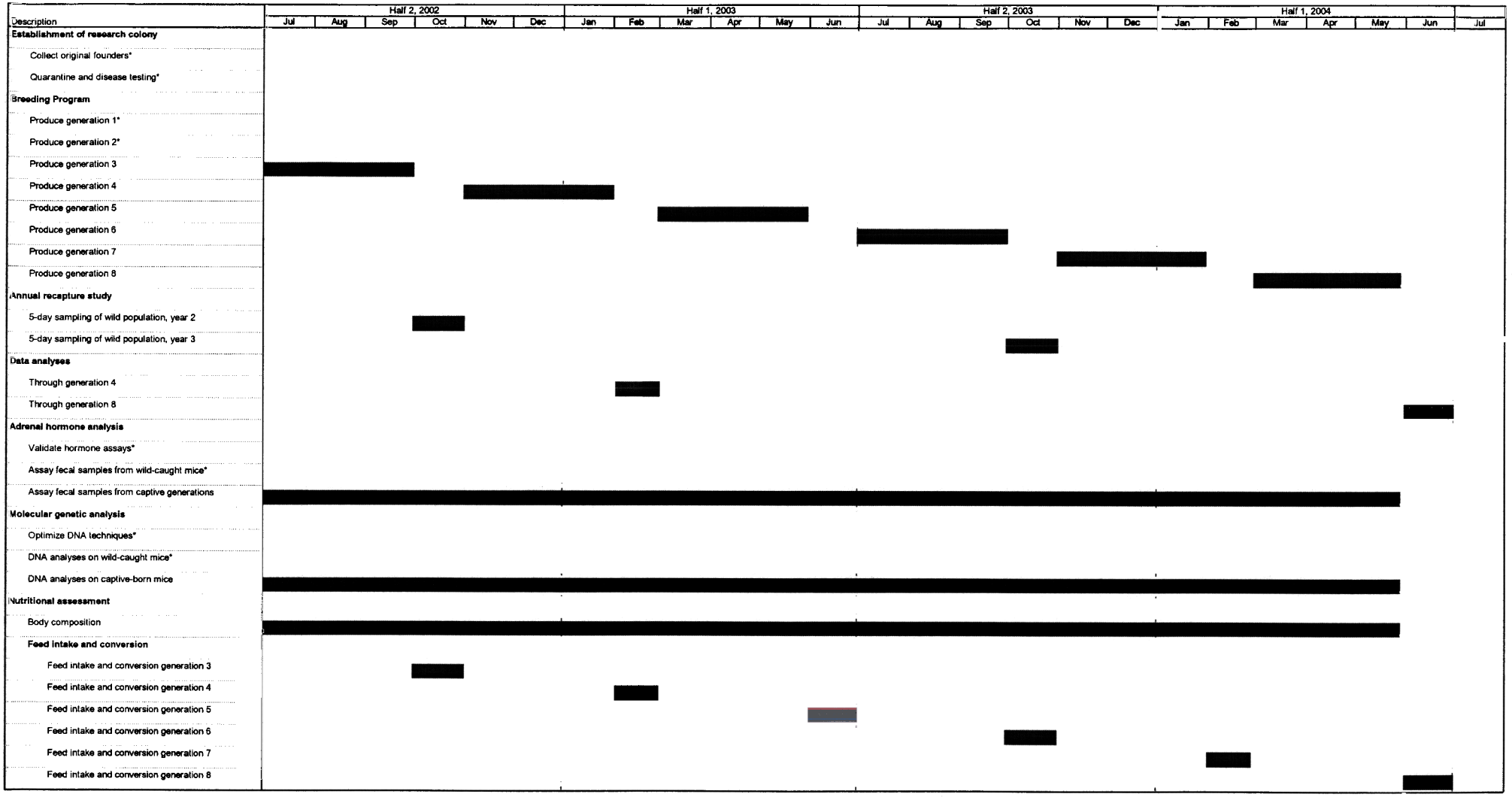
Chicago Zoological Society
Experimental Tests of the Effects of Captive Breeding of Wildlife

Schedule of Completion



* indicates that task is scheduled for completion before the requested IMLS CP funding period.

Project Budget Form

SECTION 3: SUMMARY BUDGET - CP AND EDUCATION COMPONENT

Name of Applicant: Chicago Zoological Society

IMPORTANT! READ INSTRUCTIONS IN PART 4 BEFORE PROCEEDING.

DIRECT COSTS	IMLS	MATCH	TOTAL
(PERMANENT STAFF) SALARIES AND WAGES	4,892	196,233	201,125
(TEMPORARY STAFF HIRED FOR PROJECT)	0	0	0
FRINGE BENEFITS	0	51,020	51,020
CONSULTANT FEES	0	0	0
TRAVEL: DOMESTIC	0	0	0
FOREIGN			
SUPPLIES & MATERIALS	71,108	0	71,108
SERVICES	0	0	0
OTHER	0	0	0
TOTAL DIRECT COSTS	$ 75,000	$ 247,253	$ 322,253
INDIRECT COSTS*	$ 0	$ 21,733	$ 21,733

* *If you do not have a current Federally negotiated rate, your indirect costs must appear in the Match column only.*

TOTAL PROJECT COSTS		$ 343,986
AMOUNT OF CASH – MATCH	$ 268,986	
AMOUNT OF IN-KIND CONTRIBUTIONS – MATCH	$ 0	
TOTAL AMOUNT OF MATCH (CASH AND IN-KIND CONTRIBUTIONS)		$ 268,986
AMOUNT REQUESTED FROM IMLS		$ 75,000
PERCENTAGE OF TOTAL PROJECT COSTS REQUESTED FROM IMLS (MAY NOT EXCEED 50%)		22 %

Have you received or requested funds for any of these project activities from another Federal agency? *(please check one)* ☐ Yes ☑ No

If yes, name of agency _____ Date _____

Amount requested $ _____

Scott Arboretum

Swarthmore, Pennsylvania

Project Type:	Environmental Survey
IMLS Award:	$46,365
Match:	$49,827
Total Project:	$73,222
Museum Budget:	$1,653,220

Sample Conservation Projects: Living Collections

Project Type	Museum	State	Award	Match	Project	Budget	Discipline
General Survey	Chicago Botanic Garden	IL	$12,456	$15,029	$27,485	$20,000,507	Botanic Garden.
Environmental Survey	Scott Arboretum	PA	$46,365	$49,827	$73,222	$1,653,220	Arboretum
Research (exceptional)	Chicago Zoo	IL	$75,000	$268,986	$343,986	$43,223,000	Zoo
Research (exceptional)	Cincinnati Zoo & Botanical Garden	OH	$75,000	$108,076	$183,076	$22,946,81	Zoo

Sample Education Components:

Museum	State	Education Award	Total Grant Award
Isabella Stewart Gardner Museum	MA	$10,000	$60,000
L.C. Bates Museum	ME	$3,110	$12,356
Preservation Society of Newport County	RI	$10,000	$58,880
St. Louis Art Museum	MO	$10,000	$23,500

Narrative Questions – Conservation Project

The Scott Arboretum of Swarthmore College

1. WHAT IS THE DESIGN OF THE PROJECT?

The project for which we are seeking funds is the re-labeling and qualifying of our living collections with embossed metal accession labels in order to computerize our mapping system. In our old mapping and plant records system, individuals of any given accession were distinguished from other same accessions by quadrant location. With the computerization of our maps, we have redefined our mapping coordinate system to points on the globe requiring us to qualify individuals of any given accession. Subsequently, this requires us to conduct a field survey of every specimen in our collections, make qualifier assignments in our plant records database, and re-label each specimen in our living collections with a newly qualified accession label. The completion of the above is an essential element to the computerized mapping of our collections. Qualifying and labeling with newly assigned qualifiers must occur before mapping, as the data collecting software requires the qualifier to link a given individual to a specific location and its unique accession information. Once we have a computerized system, mapping collections, updating maps and using the information will be much more effectively accomplished.

Computerization of our maps began in 1999 in order to link Arboretum collections mapping with the college's effort to map facilities. The CAFM (Computer Aided Facilities Management) project, coordinated by the Facilities Department of Swarthmore College started in 1995, produced a campus base map. Recent completion of the North Campus Development Project added thousands of new plants to our collections. So, it seemed timely to address the opportunities of new technology, mapping, and record keeping. Our hand-drawn maps could not be transferred to the college's computerized format. Therefore, we purchased mapping software (BG-Map™) compatible with our existing plant records database (*BG-BASE*™) and the mapping software used by CAFM (Aperture™) this past spring. We are currently surveying the entire collection to assign qualifiers in the plant records database and mapping all living accessions with Global Positioning System equipment that was purchased in the spring of 2001. Each individual accession needs to receive a new accession label with the newly assigned qualifier to link the individual with our plant records database and new computerized map. Our current accession label machine is an antiquated Addressograph® 350 requiring the operator to manually punch one letter at a time by sliding the type bar to the character and lowering the handle. With current rates of production, we are limited to 30 accession labels per hour. This method also requires staff time to review work for inevitable inaccuracies. With over 15,000 labels to be made, valuable staff time would be needed to produce such quantities with the current machine. With the notification of award of IMLS conservation funds, we will purchase a new computer driven, metal embossing machine that links directly to our plant records database to produce our accession labels. This new embossing machine will dramatically increase production rates and, more importantly, will insure accuracy.

While the computerization of our maps has begun, the schedule of completion calls for the re-labeling segment of the project to move ahead efficiently with the purchase of a new label making machine. At the same time the Plant Records Consultant will begin his two-year tenure and necessary supplies will be purchased. This proposal calls for the Plant Records Consultant to spend an average of 5 hours per week for two years producing, assembling and installing accession labels as related to the surveying and computerization of our collections' maps. Rhoda Maurer, Plant Records Supervisor, will spend 55% of her time on this project guiding the qualifying process and data entry in the plant records database. Andrew Bunting, Curator, will spend 25% of his time assisting with the fieldwork associated with qualifying our accessions. The schedule of completion outlines producing and adding 625 qualified labels per month on average.

Heavy-duty durable aluminum stakes will support accession labels where appropriate; larger shrubs and trees will have the label hung from a branch or mounted directly to the trunk. In this project, 3,000 stakes are budgeted. Updated collections maps and bi-annual inventory reports will be printed and made available to staff, members and visitors through distribution or library access. But perhaps the most important benefit to the conservation of our collections will come from the accurate labeling of our collections. Even with careful attention, the hand punching Addressograph® leaves room for human error, while the database driven model will allow us to nearly eliminate error on our labels. The new accession label will tie every specimen into the newly created computerized maps with location and accuracies within three inches.

Re-labeling and qualifying every individual specimen in our collections will provide for the completion of the foundation work necessary to develop computerized maps. Tangible products of this project include the acquisition of the label making machine, the production and placement of 15,000 qualifying labels in our collections and updated collections' maps. These highly accurate maps will be integral to the long-term management of our collections. Besides serving as location documentation, Arboretum and Facilities Planning staff will use these maps to assist with campus planning and Arboretum collections development and preservation. In summary, the product of this project will allow for a more sophisticated plant records system and continued improvement of our collection's documentation upon which interpretation, education, and management of collections depends.

2. WHAT IS THE OBJECT(S), HISTORIC STRUCTURE(S), OR SPECIMEN(S) THAT IS THE FOCUS OF THIS PROJECT?

The entire living collection of the Scott Arboretum is the focus of the re-labeling and computerized mapping project. In keeping with it's mission statement, the Arboretum displays the best ornamental plants suitable for the Delaware River Valley and suitable for planting by the average gardener. The Arboretum's living collections, which have been actively curated and for which extensive plant records have been kept since the Arboretum's inception in 1929, now represents an extensive cross-section of woody plants including over 17,000 individual specimens, representing approximately 3,200 taxa. The collections are arranged in both collections by genera and displayed in landscape situations spread out over

the campus of Swarthmore College. The conservation of our living collections at the Arboretum is at the foundation of our mission. Without plant records and collections maps, the institution and the collections themselves would loose their historical, educational and scientific integrity and significance.

The Arboretum's collections serve a vast diversity of constituents. They provide a place of learning for the students and college community of Swarthmore College. They provide a place for horticultural study for surrounding home gardeners and students of courses from Williamson Trade School, Temple University, Morris Arboretum, Longwood Gardens, etc. The Arboretum is the host site for professional horticultural conferences held in collaboration with Pennsylvania Horticultural Society, Delaware County Extension, Hardy Plant Society, Tyler Arboretum, Morris Arboretum and the Pennsylvania Nurseryman's Association. Additionally we share many unusual taxa with local nurseryman through our Propagation Request Program in hopes of assisting the introduction of good plants for the Delaware River Valley region. Our holly collection is recognized as a North American Plant Collections Consortium collection. Our collections also serve as a host site for the evaluation of plants recognized for the Pennsylvania Horticultural Society's Gold Medal award.

3. HOW DOES THE PROJECT RELATE TO YOUR MUSEUM'S ONGOING CONSERVATION ACTIVITIES?

The Arboretum has received eight IMLS general operating support grants between 1987 to 2000. These awards have in part funded temporary long-term and short-term positions and plant records supplies as required for various plant records projects. The Arboretum was awarded a Conservation Grant in 1988 to conduct its first Conservation Survey that was completed at the end of May 1990. Also as a part of the award, the Arboretum successfully transferred all of its plant records from index cards to a computerized format, *BG-BASE*™ and documented a long-range management plan for our collections. As part of our Conservation Survey, we initiated a soil testing and fertilization program, formed the Collections Committee and project proposal system, and formalized the Integrated Pest Management program and Arboretum Maintenance Standards review process. Other conservation activities include the creation of a plant records manual, a protocol for curating a genus or specified collection within the Arboretum's holdings, and the development of the 3-year curatorial plan. This plan is updated every three years to reflect current goals. In order to assist with the upkeep of our collections' documentation, we created a Label Maintenance Group of volunteers that is responsible for checking on accession label attachment and adjusting as plants continue to grow. Curatorial and map archives were assessed and stored according to archival storage methods recommended by the curator of the College's library. The North American Plant Collections Consortium for whom we continue to review and submit annual reports has recognized our holly collection since 1994 We have a reputation as one of the best-labeled gardens in the Delaware Valley, an area of the country where standards are high. Richard Gillis, Horticultural Taxonomist at the Dow Gardens wrote us "... I wasn't looking forward to my trip to the Scott Arboretum. It just goes to show you never can tell. Swarthmore College was one of the most beautiful integrations of plants and architecture I have ever seen. The Scott Arboretum plant collections were outstanding. Last but not least, hats off to whoever is responsible for your

plant labeling. They've done an excellent job." Robin Zitter, garden designer, wrote "I just had to drop you a note to say I visited the Scott Arboretum for the fist time last week and was incredibly impressed. The wealth of plants so tastefully arranged, new and old (the swamp white oaks took by breath away – never saw any that size before). We found labels on most everything – what a joy to know what you're looking at. The feeling created is not at all institutional but a top notch plant collection landscaped among a functional space. I consider this to be one of the best on the East Coast."

During the past two years, we have made significant improvements to our conservation activities. Integral to the success of the Arboretum's integration with the Facilities' CAFM Project, the Plant Records Supervisor position was created to facilitate the computerization of our collections' maps. As a result of this computerization and due to the nature of our previous mapping system, qualifying and re-labeling each individual specimen has become our primary conservation need at this time. This project will secure the link of each specimen to its associated plant records in *BG-BASE*™ and to its location data in our computerized mapping program, BG-Map™. This project is key for securing the integrity of our collections documentation.

4. WHAT ARE THE ANTICIPATED BENEFITS OF THIS PROJECT?

This project will benefit the Arboretum fundamentally by producing direct improvements in our collections' documentation. Accurate and long-lasting accession labels are intimately linked to the qualifying process in our plant records database and hence the computerization of our collections' maps. But these direct benefits are far-reaching. Improved collections documentation will allow us to produce many different types of interpretive maps for both Arboretum visitors and for use by our Collections Committee. These maps will be made available to visitors and can be added interpretation to our existing educational brochures. A comprehensive collections' map located in our library has and will continue to serve visitors and researchers alike. The re-labeling and qualifying project will also ensure accurate collections' documentation is used to make critical decisions in the plant collections review and management process, curation of collections, and in planning campus and collections' development.

Most of the Arboretum's recent financial commitment towards the conservation of our collections has been in the support of our collections computerized mapping project. We have created and secured the Plant Records Supervisor position, spent $40,000 on mapping equipment and software, $21,000 on labeling supplies, another $3,000 on staff training and created short-term internship positions to assist with special project. To date, 2,000 new qualified labels have been made and installed.

5. HOW WILL THE APPLICANT ENSURE THAT ONGOING MUSEUM FUNCTIONS ARE NOT INHIBITED BY THESE PROJECT ACTIVITIES?

Most of the Arboretum's match for this project will be in the form of our Plant Records Supervisor's time which is split between the re-labeling and qualifying project (55%) and

other plant records responsibilities, i.e. mapping, plant records database management. This time is intentionally flexible to allow for seasonal needs and work loads. Our Curator will devote approximately 25% of his time in a similar seasonally flexible schedule. This flexibility will ensure that ongoing museum functions are not inhibited by the project activities. With the additional contribution of a Plant Records Consultant as outlined in this project, staff time spent on other job responsibilities will not be inhibited. The Plant Records Consultant will also ensure the heavy workload required to get the system up and running is accomplished in a two-year period.

6a. WHAT ARE THE PROPOSED CONSERVATION METHODS AND WHY ARE THEY CONSERVATIONALLY SOUND?

Aluminum accession labels mounted on heavy-duty aluminum stakes or hung by plastic coated electrical wire composes the materials used to label our collection. Labels are attached to large specimens with stainless steel screws. These materials are in keeping with common conservation practices of botanic garden and arboreta. Our current embossing machine is not efficient in terms of staff time or accuracy, therefore we are seeking funding to improve this method of producing labels with a computer driven model, the DataCard 295. This model was selected after careful first-hand comparisons to other units used by peer botanic gardens and arboreta using *BG-BASE*™ for plant records. The DataCard 295 is both time and cost efficient, while providing the capability to directly link with our plant records database, therefore eliminating inaccuracies inherent in the current method of producing accession labels. This system has few if any safety issues to staff, visitors or collections.

Our Plant Records Supervisor has over 5 years experience managing living and non-living collections. She has developed the computerized mapping project we are currently engaged in and has produced procedures and protocols to assist in project tracking to ensure efficient and thorough execution. Our plant records database, *BG-BASE*™, is now used at over 130 gardens worldwide while BG-Map™ has over 30 installations.

7. HOW DOES THE PROJECT BUDGET SUPPORT THE PROJECT GOALS AND OBJECTIVES?

The budget for this project was developed by evaluating all the needs (personnel, equipment, supplies) necessary to qualify and add qualified labels to the Arboretum's collections. The project costs were determined by identifying how many plants in the Arboretum's collections need to be qualified and re-labeled. The budget is calculated on the following requirements: qualifying plants-300 hours, label production-85 hours, label assembly-500 hours, label placement-1,500 hours. The purchasing of an automated aluminum embossing machine will enable us to make our accession tags 12 times faster, as well as ensure optimum accuracy. Through our computerized database, *BG-BASE*™, we were able to identify how many individual plants had not been qualified and were then able to make projections for supplies needed and labor to complete the project.

The machine we selected for this project, the DataCard 295 Aluminum Embossing System, can be linked directly with our plant records system, *BG-BASE*™. This will enable us to make our new accession tags accurately and efficiently. While other systems exist (many of which are more expensive and have advanced capabilities) we feel this system will fulfill accession labeling needs of the Arboretum for the life of the machine. The materials proposed are durable and long lasting and consistent with plant records supplies used by the Arboretum in the past, as well as, consistent with materials used by other botanic gardens and arboreta. For all materials we have received current cost quotes. We have also researched the quality of the materials and compared different vendors for quality of materials and price.

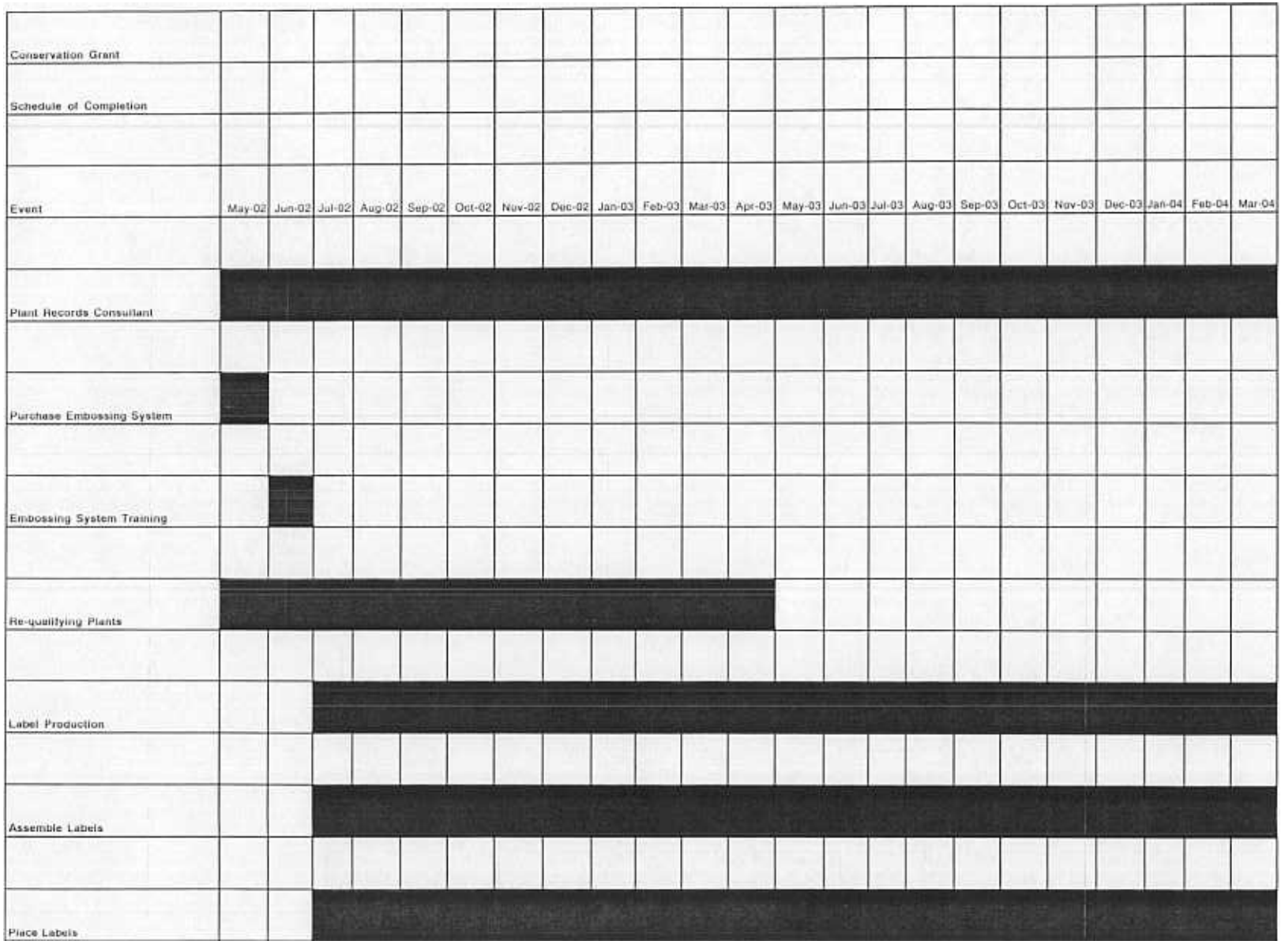
This project utilizes the existing staffs of the Arboretum, Andrew Bunting, Curator, and Rhoda Maurer, Plant Records Supervisor, who have extensive plant records experience. These staff salaries and fringe benefits were calculated based on the percentage of work each person would complete over the granting period. This amount is the major matching portion of the grant. To assist with the project and ensure that the Arboretum staff completes it's other Arboretum duties, monies are requested to hire Robert Herald as Plant Records Consultant to assist with the expanded re-labeling of the Arboretum's collections.

8. WHAT ARE THE QUALIFICATIONS AND RESPONSIBILITIES OF THE PROJECT PERSONNEL?

Rhoda Maurer, Plant Records Supervisor, will guide the qualifying process and subsequent data entry in the plant records database. She also oversees all plant records activities at the Scott Arboretum, including plant records database management, computerized mapping, accessioning and labeling. In addition to her work at the Arboretum, she has extensive plant records experience at the Elizabeth Miller Botanic Garden in Seattle, Washington and the Royal Horticultural Society Garden, Wisley, England.

Andrew Bunting, Curator, will be responsible for overseeing the integrity of the project, as well as assisting with the fieldwork associated with qualifying our accessions. Andrew Bunting manages the Plant Records Supervisor and Curatorial Intern at the Arboretum and ensures all plant records are maintained to the highest level of accuracy and up to date nomenclature. In addition to his work at the Arboretum, he has gained plant records experience at the Morton Arboretum, Lisle, Illinois, Chicago Botanic Garden, Chicago, Illinois, Fairchild Tropical Garden, Miami, Florida as well as overseas experience at Tintinhull Garden in England and Titoki Point in New Zealand.

Robert Herald, Plant Records Consultant, will be responsible for producing, assembling and installing newly qualified accession labels for the Arboretum's collections. For 10 years, he worked as an assistant to the Curator in the Plant Records Department at Longwood Gardens, Kennett Square, Pennsylvania. He was responsible for accessioning, mapping and labeling plants throughout Longwood's extensive plant collections. Robert Herald has additional plant records experience from Chicago Botanic Garden and the Marie Selby Botanical Gardens, Sarasota, Florida.


Conservation Grant
Schedule of Completion
Event
May-02
Jun-02
Jul-02
Aug-02
Sep-02
Oct-02
Nov-02
Dec-02
Jan-03
Feb-03
Mar-03
Apr-03
May-03
Jun-03
Jul-03
Aug-03
Sep-03
Oct-03
Nov-03
Dec-03
Jan-04
Feb-04
Mar-04
Plant Records Consultant
Purchase Embossing System
Embossing System Training
Re-qualifying Plants
Label Production
Assemble Labels
Place Labels

Project Budget Form

SECTION 3: SUMMARY BUDGET - CP AND EDUCATION COMPONENT

Name of Applicant: The Scott Arboretum of Swarthmore College

IMPORTANT! READ INSTRUCTIONS IN PART 4 BEFORE PROCEEDING.

DIRECT COSTS	IMLS	MATCH	TOTAL
SALARIES AND WAGES *(PERMANENT STAFF)*		$36,021	$36,021
SALARIES AND WAGES *(TEMPORARY STAFF HIRED FOR PROJECT)*	$14,310		$14,310
FRINGE BENEFITS		$10,806	$10,806
CONSULTANT FEES			
TRAVEL: DOMESTIC	$2,025		$2,025
TRAVEL: FOREIGN			
SUPPLIES & MATERIALS	$29,190	$3,000	$32,190
SERVICES			
OTHER	$840		$840
TOTAL DIRECT COSTS	$ $46,365	$ $49,827	$ $96,192
INDIRECT COSTS*	$	$	$

* *If you do not have a current Federally negotiated rate, your indirect costs must appear in the Match column only.*

TOTAL PROJECT COSTS		$ $96,192
AMOUNT OF CASH-MATCH	$	
AMOUNT OF IN-KIND CONTRIBUTIONS-MATCH	$ $49,827	
TOTAL AMOUNT OF MATCH (CASH AND IN-KIND CONTRIBUTIONS)		$ $49,827
AMOUNT REQUESTED FROM IMLS		$ $46,365
PERCENTAGE OF TOTAL PROJECT COSTS REQUESTED FROM IMLS (MAY NOT EXCEED 50%)		48 %

Have you received or requested funds for any of these project activities from another Federal agency? *(please check one)* ☐ Yes ☑ No

If yes, name of agency _____ Date 10-05-01

Amount requested $ _____

Chicago Botanic Garden

Glencoe, Illinois

Project Type:	General Survey
IMLS Award:	$12,456
Match:	$15,029
Total Project:	$27,485
Museum Budget:	$20,000,507

Sample Conservation Projects: Living Collections

Project Type	Museum	State	Award	Match	Project	Budget	Discipline
General Survey	Chicago Botanic Garden	IL	$12,456	$15,029	$27,485	$20,000,507	Botanic Garden.
Environmental Survey	Scott Arboretum	PA	$46,365	$49,827	$73,222	$1,653,220	Arboretum
Research (exceptional)	Chicago Zoo	IL	$75,000	$268,986	$343,986	$43,223,000	Zoo
Research (exceptional)	Cincinnati Zoo & Botanical Garden	OH	$75,000	$108,076	$183,076	$22,946,81	Zoo

Sample Education Components:

Museum	State	Education Award	Total Grant Award
Isabella Stewart Gardner Museum			$60,000
L.C. Bates Museum	ME	$3,110	$12,356
Preservation Society of Newport County	RI	$10,000	$58,880
St. Louis Art Museum	MO	$10,000	$23,500

1. What is the design of the project?

The Chicago Botanic Garden requests a grant of $12,456 to conduct a General Conservation Survey of its living plant collection. The Garden's living plant collections includes 1.8 million plants representing about 8,500 taxa. The Garden also holds a collection of sculpture, a library collection of 18,000 books and a herbarium with 12,000 specimens that support the living plant collection. However, the living plants, as the Garden's largest and most fundamental collection, will be the focus of this survey. The plant collections are displayed for the public in 21 specialty gardens, a 100-acre oak woodland, a 15-acre Illinois prairie and an urban river. The Garden's site is made up of nine islands surrounded by 60 acres of lakes. Each year, up to 800,000 people visit the Garden to enjoy and learn from the plant collections, displays and education programs. It is important that the Garden's plant collections be well planned for, developed and curated so that they are of greatest value to visitors, students and the scientific community.

The General Conservation Survey will be an important step in the Garden's overall planning and collections care activities. After three years of planning, the Garden's Long-range Collections Management Plan (living plants section attached) is nearly complete. This comprehensive document covers collections development, policies, documentation, access, protocols and security of the entire living plant collection. In addition, a Long-range Plan for Collections Documentation will be completed in late 2001. If a grant for a General Conservation Survey is awarded, these two documents will provide valuable background information for the consultants conducting the survey. The living plants section of the Collections Plan and the Collections Documentation Plan will be modified as necessary based on the consultants' recommendations. Most importantly, the General Conservation Survey will guide long-range plans for specific segments of the living plant collection, including woody plants, perennials, aquatics and native habitats, along with the underpinning of documentation. These more specific long-range plans are in various stages of completion and will benefit greatly from the findings of the survey.

The survey will be conducted in July 2002 by a team of three consultants: Paul Meyer, Director of the Morris Arboretum in Philadelphia, Holly Forbes, Curator of the University of California Botanical Garden at Berkeley and Rick Lewandowski, Director of Mt. Cuba Center in Philadelphia. These consultants will work closely with a team of Garden staff including the Executive Vice President and Director of the Garden, the Director of Plant Collections, the Curators of Woody Plants and Aquatics, the Director of Research, the Manager of Collections Documentation, the Director of Horticulture and the Restoration Ecologist.

With three experts conducting the survey, the Garden's collections can be divided so that each person has sufficient time to learn about and view their portion of the collection during their three days on site. Each member of the Garden's staff team will dedicate some portion of the three days to assist with the survey and follow up with the written report. The project activities are divided as follows:

Step One: Preparation for the Survey (October 2001 – June 2002)
In preparation for the survey, Garden staff will 1) complete the Collections Management Plan (including living plants, herbarium, library and sculpture) and Collections Documentation Plan and 2) provide an inventory of the Garden's living plant collection for the consultants' reference. These activities are important whether or not a grant is awarded for the General Conservation Survey, and are planned for the coming six months as a part of ongoing activities.

Step Two: General Conservation Survey (July 2002)
The team of consultants will spend three days together at the Garden to conduct the survey. The likely schedule for the three days is attached to this proposal.

Step Three: Writing the Survey Report (July – September 2002)
After the on-site visit, the consultants will write their sections of the survey report, which will be combined to create one report. The final report will be complete within 60 days after the site visit.

Step Four: Modification of the Garden's Collections Plan and Completion of Long-range Plans for Specific Areas (October 2002 – April 2003)
After the General Conservation Survey is complete, Garden staff will revise the living plant section of the Collections Management Plan, the Collections Documentation Plan and complete the Conservation Plans for Woody Plants, Perennials, Aquatics, Native Habitats.

2. What is the object(s), historic structure(s), or specimen(s) that is the focus of this project?

The Chicago Botanic Garden holds 1.8 million plants representing 8,527 taxa, 202 plant families, 69,029 woody plants, 1,577,988 perennials, 14,917 aquatic plants, and 31,257 tropical plants. The Garden holds the largest extant collection of hardy herbaceous perennials in the upper Midwest and has a large and distinctive collection of woody plants, especially in its spirea, willows, crabapples, and maples. Twelve genera in the living collections (*Allium*, *Amelanchier*, *Cornus*, *Geranium*, *Iris*, *Miscanthus, Nelumbo, Parthenocissus*, *Rosa*, *Salix, Scirpus* and *Thuja*) form collections of regional importance to the upper Midwest. Seven genera (*Ginkgo, Quercus, Aster*, *Carex*, *Narcissus*, *Solidago* and *Spiraea*) comprise collections of national importance, representing both breadth and depth within these genera.

The Garden's living plant collections are the foundation of its education and research programs. On a broad level, plants in garden displays are interpreted through signs and brochures for visitors. The collections are also used extensively by students enrolled in classes at the School of the Chicago Botanic Garden, which offers a variety of plant-related courses for adults. The Garden's collections are used as a living laboratory and subject matter for these students studying botany, ecology, gardening, botanical art and other subjects. In addition to offering classes, the School also hosts up to ten symposia each year that attract scientists, students and professionals. Symposium topics often stem from the Garden's living collections, such as the recent *New Ornamental Crops Symposium* and upcoming symposiums on *The Ecology of Oak Woodlands, The Perennial Plants Conference* and *Landscaping with Native Plants* -- all areas of specialty for the Chicago Botanic Garden based on its plant collection.

The research program also relies on the Garden's collections, which contribute to the understanding and preservation of rare and endangered plants. The collection holds 284 taxa of conservation concern listed by the International Union for the Conservation of Nature (IUCN) and 525 taxa listed by the Convention of the International Trade in Endangered Species (CITES). The Garden's endangered plant research program is currently conducting research and restoration work on 20 rare taxa that are native to the Midwest. Five of these -- *Aster furcatus*, *Viola conspersa*, *Hymenoxys acaulis* v. *glabra*, *Cirsium pitcheri*, *Scirpus hallii* -- occur in the Garden's living collections.

Also, within the living collections are research collections used by the Garden's applied horticulture program. The Garden's Center for Ornamental Plant Development has programs in plant breeding, evaluation, and introduction with the goal of developing, distributing, and promoting the best performing ornamental plants for the Upper Midwest. The Center's 10,000 plants (1,400 taxa) are on public display and are available to students, outside researchers, and nursery professionals. The research program has laboratory facilities equipped for tissue culture propagation and light microscopy studies. Research results are disseminated through articles in refereed journals and popular gardening magazines; staff presentations to professional organizations and plant societies; booth displays at horticultural trade shows; and Garden tours and classes. The Center sends its publication *Plant Evaluation Notes* to 6,000 gardeners, landscape designers, nursery industry professionals, and plant researchers four times a year.

3. How does the project relate to your museum's ongoing conservation activities?

Through its outdoor living plant collections, the Chicago Botanic Garden displays a comprehensive representation of the best plants for the upper Midwest. The Garden's site is unusual in its fairly equal division of land dedicated to lakes, native habitats and horticultural displays. A restored woodland, prairie, and river plus 21 landscape display gardens help educate, serve as a repository of germplasm and act as a respite for nearly 800,000 annual visitors. On a ten-year average, about 1,000 accessions have been added to the living plant collections each year. The Garden is currently constructing the largest garden project in its

history -- a five-acre island with informal plantings emphasizing hardy herbaceous perennials and grasses, adjacent to a seven acre lake with two acres of lakeside gardens. These new gardens will dramatically increase the plant accessions, provide an educational tool for shoreline restoration and create a beautiful display of masses of aquatic and emergent plants. As these new gardens are added and the collections are expanded, it is an important time to address the conservation and curation of the collection.

Responsibility for the curation and care of the collections falls under two departments, Horticulture and Collections. The Horticulture Department maintains the grounds and cares for plant specimens -- pruning, weeding, irrigating, planting, mulching and pest control. Curators manage the plant collections, plan for their development and study and disseminate collections information through lectures, publications and professional organizations. This is an appropriate time to have consultants review the Collections Management Plan and its integration with other programs within and outside the Garden.

In 1998, the Garden began to upgrade and standardize the software used in the various plant databases utilizing a Microsoft Access template from Botanic Gardens Conservation International (BGCI). This template has been used by over 450 botanic gardens worldwide. Each accessioned plant contains up to 30 fields of data, and with the completion of the software linkages, up to 120 fields will be available. Accession fields include accession number, scientific name, author, literature citation, source, growth habit, quantity, size, date of arrival, and initial planting location. The Garden is completing the linkage of separate non-public databases containing accessioned plant records, mapping coordinates, plants in the production greenhouses, plants under evaluation and plants that have been dedicated through the Tribute Gift program.

Front line horticulture, collections and programmatic staff are responsible for forwarding to collections documentation staff information related to new accessions, transfers of accessioned plants between locations and removal of plants from the collections. Collections Documentation staff are responsible for entering the data into the database, maintaining maps of the locations of the plants and producing labels to identify the plants. Building on this foundation of data, the Garden is currently undertaking four different Web projects to make the information contained in these and other databases available to a wider audience through the Internet.

4. What are the anticipated benefits of this project?

Completing a General Conservation Survey using outside experts will be of great value to the Garden. It will provide an opportunity for Garden staff to discuss the appropriateness of the Garden's specialty and secondary collections and their relevance regionally, nationally and internationally. The consultants will be asked to address societal issues related to conservation, education and research and make observations on internal connections to conservation, education, research and the Garden's marketing efforts. Specific guidance on linkages and strategic plans to address short and long-term concerns would prove valuable in relation to collections development, documentation and display quality.

Recommendations will be shared with a wide group of stakeholders including the Garden's President, Board and senior staff and incorporated into the Collections Management Plan. As these recommendations are implemented, the collections will be enhanced for the visitors, students and scientists who enjoy and learn from them. In addition, the survey will guide Garden staff in the review and modification of existing management protocols for acquisition, documentation study and dissemination.

A General Conservation Survey will lay the groundwork for more detailed surveys in the future. We anticipate that a detailed condition survey of some segment of the collection will be our next step. The consultants' recommendations will help to identify which segment of the collection would benefit most from a more detailed survey.

5. How will the applicant ensure that ongoing museum functions are not inhibited by these project activities?

Although the members of the project team will be required to spend much of the three days with the consultants, they will be able to prepare for this and delegate time-sensitive tasks to other qualified staff. The General Conservation Survey and the long-range plans it supports are integral to the responsibilities of

these staff and will help them achieve these important goals for the Garden's benefit. After the on-site visit ongoing museum functions will be enhanced, especially as a result of the half-day workshop on collections care, which will be presented to a wider group of staff.

6a. What are the proposed conservation methods and why are they conservationally sound?

The Garden has selected well-qualified consultants to conduct the General Conservation Survey to ensure that the highest conservation standards are met. Each consultant brings in-depth knowledge about plant collections in a botanic garden as well as specific knowledge about the segment of the collection that they will review. Before their visit, the consultants will be asked to review background documents such as the Garden's Strategic Plan, the Collections Management Plan and collections documentation data. Consultants will use a survey format (attached) that has been developed by Peter Bristol, the Garden's Curator of Woody Plants, based on forms used for other similar reviews. Mr. Bristol has completed eight Management Assessment Program surveys, three American Association of Museums accreditation field reviews and five Heritage Preservation Conservation Assessment Program reviews.

6b. Describe your rationale for the proposed training curriculum

Garden staff are eager to take advantage of the expertise of the three participating consultants. During the proposed half-day workshop, the consultants will share their survey findings and knowledge about plant care with a broader group of Garden staff who are directly responsible for day-to-day documentation data collection, proper plant culture and maintenance of the collections. The audience for this workshop will include horticulturists, ecologists, research staff, collections documentation staff, interns and volunteers. During part of the workshop, staff will be divided into groups based on the plant types they are responsible for, such as woody plants, perennials, aquatics, research plants or native habitats, to learn about specific care techniques.

7. How does the project budget support the project goals and objectives?

The project budget reflects the costs for conducting and writing the General Conservation Survey, holding a half-day workshop, and staff time for completing and revising the Collections Plan and Long-range Plan for Collections Documentation as well as working on conservation plans for woody plants, perennials, aquatics and native habitats. The Garden is contributing $15,029 in in-kind matching funds towards reaching these goals. All hourly rates and fringe benefits are based on actual salaries and fringe benefits for those involved in the project. In addition, the Garden will contribute the air travel for each of the three consultants. Through a sponsorship agreement with American Airlines, the Garden receives an annual allotment of free airline tickets for travel by staff and guests. The value of each round trip ticket, included in the match, is based on actual fares as of this date. The Garden does not have a current federally-negotiated indirect cost rate and is using the rate of 20%.

The requested grant would cover consultant fees and lodging, meals and local travel for three days and three nights (we are planning to have the consultants arrive in Chicago the night before they are scheduled to begin work, to ensure three full work days). Lodging costs of $119 per night are based on the actual weekday rate at the Sheraton North Shore, which is very close to the Garden. Other costs include cab fare to and from O'Hare airport ($30/trip) and meals ($45/day). Fees were agreed upon by each consultant, based on their time and level of expertise.

8. What are the qualifications and responsibilities of the project personnel?

Consultant Team

Paul Meyer, Director, The Morris Arboretum of the University of Pennsylvania has been with the Morris Arboretum for 25 years. Before becoming Director in 1991, her served as Director of Horticulture for eight years and Curator of the Living Collection for 15 years. He led an IMLS-funded project to develop a BG-map system that is now widely used by gardens around the world. In addition, he has conducted field reviews for living plant collections at two Florida gardens and has served as a consultant, advisor and board

member to several botanic gardens and arboreta. He holds a Master of Science in Plant Science/Public Garden Management and a Bachelor of Science in Landscape Horticulture. Mr. Meyer will be responsible for surveying the Garden's collection of woody plants and research collections.

Holly Forbes, Curator, University of California Botanical Garden has 16 years experience working with botanical gardens. Since 1988, her role has been in curation, including collections documentation, development, and evaluation. She has consulted with colleagues at other botanical gardens and arboreta on many collections issues and serves as a reviewer for the American Association of Botanical Gardens and Arboreta (AABGA) North American Plant Collections Consortium. She reviewed the Mesoamerican Cloud Forest collection at Strybing Arboretum in San Francisco and is completing a review of the *Ilex* collection of the Washington Park Arboretum this fall. At the University of California Botanical Garden at Berkeley she has led or participated in many collections reviews that included all the stakeholders of the organization. She holds a Bachelor of Science in environmental biology. Ms. Forbes will work with the Director of Plant Collections and the Curator of Aquatics to survey the Garden's perennials and aquatic plants in addition to working with the Director of Research to review the research collections.

Rick J. Lewandowski, Director, Mt. Cuba Center has overseen the development and transition of Mt. Cuba's 630 acres of natural lands, cultural landscapes and managed gardens from private estate to public garden. He continues to be involved with development of the gardens and facilities with a focus on research on the Piedmont flora of the eastern United States. Mr. Lewandowski also conducts plant exploration and introduction programs to enrich the living collection and provide a resource for future research. He holds a Bachelor of Science in Landscape Horticulture and a Master of Science in Ornamental Horticulture. He will work with the Garden's Restoration Ecologist to survey the Garden's native habitats and the Director of Research to survey the research collections.

Chicago Botanic Garden Staff Team

Kris Jarantoski, Executive Vice President and Director has been on staff at the Garden for 24 years. He has extensive experience in management and development of personnel, plant collections, programs, research and departmental organization at all levels of public garden administration. Mr. Jarantoski has played an integral role in developing the Chicago Botanic Garden from a young garden to one of the major botanic gardens of the world. He has directed construction of gardens and buildings and ongoing design at the Garden and shares his vast horticultural expertise with a broad public. Mr. Jarantoski holds a Bachelor of Science in Ornamental Horticulture, a Master of Science in Ornamental Horticulture/Botany and a Master of Business Administration. He will meet with all of the consultants and accompany Paul Meyer as he surveys the Garden's woody plants.

Galen Gates, Director, Plant Collections oversees a specialized curatorial staff and the Garden's extensive plant collection. He has led plant expeditions into the Caucasus Mountains, southern Siberia and the Russian Far East to acquire plants new to this country. He has contributed to over 60 book titles to date and is the author of numerous plant-related articles in professional journals and trade magazines. His background in teaching, plant evaluation, construction and maintenance has made him a consultant to nurserymen, landscape design/build firms, book publishers, and seed companies. Mr. Gates holds a Bachelor of Science in Horticulture. He will provide oversight to the project and will work with each of the three consultants while they are on-site. He will also work with Holly Forbes to review the Garden's perennial and aquatic plants.

Peter Bristol, Curator, Woody Plants joined the Chicago Botanic Garden in March of this year. For the last 24 years, he was with the Holden Arboretum, most recently as Director of Horticulture. He is recognized as a leading expert in woody plants and holds leadership roles in the American Association of Botanic Gardens and Arboreta and the International Ornamental Crabapple Society. He has conducted similar IMLS-funded

surveys for other botanic gardens and arboreta throughout his career. Mr. Bristol holds a Master of Science in Ornamental Horticulture and a Bachelor of Science in Plant and Soil Science. He will work most closely with consultant Paul Meyer as he conducts his study of the Garden's woody plant collection and will be responsible for coordinating for the site visit.

Boyce Tankersley, Manager, Collections Documentation joined the Garden in 1998 and is responsible for all aspects of collections documentation including computerized records, inventories, and mapping. Previously, he served as the Curator of Living Collections at the Missouri Botanical Garden. At Missouri, Mr. Tankersley identified and vouchered living plants, identified slides of the living collection, and worked with computer specialists to convert the plant records database to a multiple-user, Windows format. He holds a Master of Science Degree in Floriculture and a Bachelor of Science in Horticulture. Because he is responsible for documenting the entire living plant collection, Mr. Tankersley will be prepare documentation data on the collections and will participate in each of the three consultants' reviews.

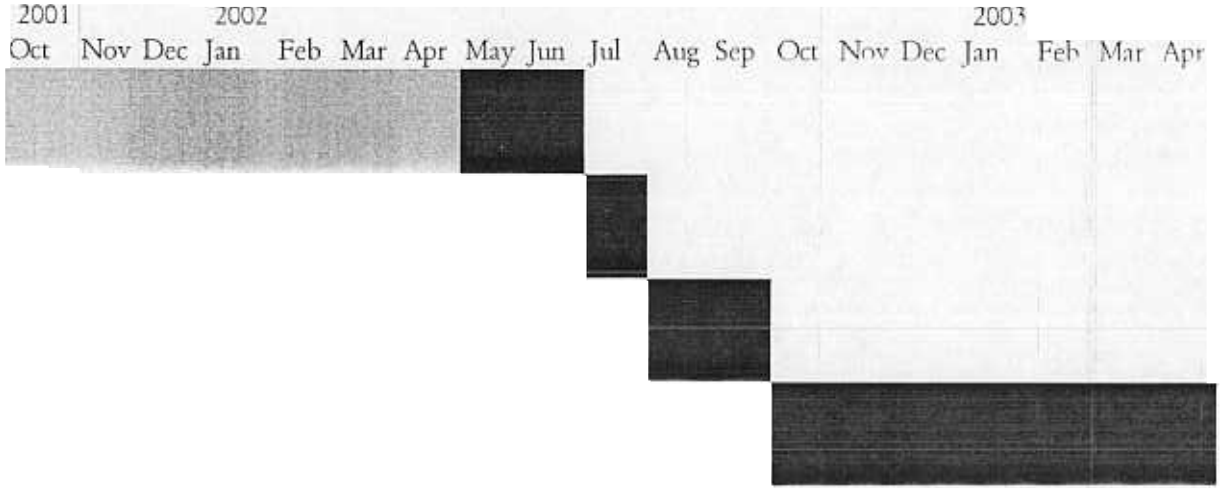
Bob Kirschner, Curator, Aquatics is an aquatic ecologist with over 20 years of experience. Before joining the Garden's staff in September 1999, he served as Principal Environmental Planner for the Northeastern Illinois Planning Commission. In addition to his vast knowledge of aquatic plants, he has forged strong partnerships and strengthened communication on water resource issues among government, institutional and environmental advocacy organizations and has authored several manuals and guides on lake water management. Mr. Kirschner will work with Holly Forbes as she reviews the Garden's aquatic plant collection.

Dr. James Ault, Director, Ornamental Plant Research has led the Chicago Botanic Garden's horticultural research program since 1995, and was previously Plant Propagator/Physiologist at Longwood Gardens in Philadelphia. As Director of the newly established Center for Ornamental Plant Development at the Garden, Dr. Ault supervises applied research programs in ornamental plant breeding, evaluation and introduction. He is well published in the tissue culture propagation of ornamental plants and has lectured extensively at professional meetings, symposia and plant societies. Dr. Ault received a Ph.D. in Plant Physiology from Louisiana State University in 1987. He will work with all of the consultants to review the plants in the ornamental horticulture research collection.

Tim Johnson, Director, Horticulture is a horticulturist with 20 years experience maintaining and developing gardens. He has been on staff at the Chicago Botanic Garden for 16 years and is responsible for the development, operations and maintenance of the Garden's 21 display gardens. Mr. Johnson holds a Bachelor of Science in Horticulture. His role in this project will be to address with the consultants the issues of care and maintenance of the display gardens and grounds.

Jim Steffen, Restoration Ecologist is responsible for the management and restoration of the Garden's 100-acre oak woodland/savanna community. In this position, Mr. Steffen inventories vegetation, birds, insects, bryophytes, fungi and mammals, conducts research and manages prescribed burns. In his 20 years as an ecologist, he has conducted many research projects and served as a educator and lecturer at the School of the Chicago Botanic Garden and elsewhere. He holds a Bachelor of Science in Biology and a Master of Environmental Arts and Science. Mr. Steffen, and other members of his staff, will work with Rick Lewandowski to review the Garden's natural areas.

Chicago Botanic Garden
General Conservation Survey
Schedule of Completion



Activity

Step One:
Preparation for the Survey
(Pre-Project Activity)

Step Two:
General Conservation Survey

Step Three:
Writing the Survey Report

Step Four:
Completing CBG Plans

Project Budget Form

SECTION 3: SUMMARY BUDGET - CP AND EDUCATION COMPONENT

Name of Applicant: Chicago Botanic Garden

IMPORTANT! READ INSTRUCTIONS IN PART 4 BEFORE PROCEEDING.

DIRECT COSTS	IMLS	MATCH	TOTAL
(PERMANENT STAFF) SALARIES AND WAGES	0	7,536	7,536
(TEMPORARY STAFF HIRED FOR PROJECT)	0	0	0
FRINGE BENEFITS	0	1,583	1,583
CONSULTANT FEES	10,800	0	10,800
TRAVEL: DOMESTIC	1,656	1,329	2,985
FOREIGN			
SUPPLIES & MATERIALS	0	0	0
SERVICES	0	0	0
OTHER	0	0	0
TOTAL DIRECT COSTS	$ 12,456	$ 10,448	$ 22,904
INDIRECT COSTS*	$ 0	$ 4,581	$ 4,581

* *If you do not have a current Federally negotiated rate, your indirect costs must appear in the Match column only.*

TOTAL PROJECT COSTS		$ 27,485
AMOUNT OF CASH – MATCH	$ 0	
AMOUNT OF IN-KIND CONTRIBUTIONS – MATCH	$ 15,029	
TOTAL AMOUNT OF MATCH (CASH AND IN-KIND CONTRIBUTIONS)		$ 15,029
AMOUNT REQUESTED FROM IMLS		$ 12,456
PERCENTAGE OF TOTAL PROJECT COSTS REQUESTED FROM IMLS (MAY NOT EXCEED 50%)		45 %

Have you received or requested funds for any of these project activities from another Federal agency? *(please check one)* ☐ Yes ☑ No

If yes, name of agency _____ Date _____

Amount requested $ _____

Isabella Stewart Gardner Museum (Sample Education Component)

Boston, Massachusetts

Project Type:	Treatment
IMLS Education Award:	$10,000
Total Project:	$60,000
Museum Budget:	$6,721,747

Project Summary:

$50,000 will be used to treat Grape Vines, a pair of rare Japanese screens from the late Momoyama period (1575-1600). $10,000 will be used to create a new curriculum to help teach about the Museum's Japanese screen collection, to construct a scale model of a six-fold Japanese screen for educators, and to produce a documentary video.

1. WHAT IS THE DESIGN OF THE EDUCATION COMPONENT?

The Isabella Stewart Gardner Museum requests a $10,000 grant to support an education component designed to advance the Museum's tradition of teaching visitors about conservation, and to promote the understanding and appreciation of Japanese screens. To take full advantage of the teaching opportunities offered by the return of the newly restored *Grape Vines* screens to the Gardner galleries, education staff will work with Anne Kitagawa, Assistant Curator of Japanese Art at Harvard University's Arthur M. Sackler Museum, to develop a new curriculum unit about Japanese screens and their context within the Gardner collection.

The new curriculum unit will be used in the Gardner's *School* and *Community Partnership Programs*, free education programs serving more than 1,000 students from nearby public schools and community organizations. Partnering teachers bring their students to the Museum for multiple visits throughout the school year and work collaboratively with Museum educators to design programs that are relevant to the students' experiences inside as well as outside the classroom. The centerpiece of the new unit will be a scale model of a traditional screen, created by Conservator Yoshiyuki Nishio, that will help students better understand the design and construction of seventeenth-century Japanese screens. The unit will also be shared with the Museum Teachers, the Gardner's adjunct teaching staff who work with both adult groups and non-partnership school groups, and with the Information Desk volunteers who interact extensively with Museum visitors of all ages.

Work on the proposed education component will begin several months before the completion of the *Grape Vines* screens' conservation treatment. In the spring of 2003, education staff will do background reading in Japanese art and history based on a bibliography developed by Anne Kitagawa. During early summer of 2003, Ms. Kitagawa will plan and lead a staff seminar. After the seminar, participants will develop a draft curriculum unit focusing on Japanese screens in the Gardner's collection to be reviewed by Ms. Kitagawa.

The proposed seminar will consist of four, three-hour sessions, and will be available to both Gardner education staff, as well as teachers from the Museum's partnering schools and community organizations. Activities will include:

- **An overview of Japanese screens.** Ms. Kitagawa will discuss examples of Asian art using works on view in the galleries at the Gardner, as well as the world-renowned collection of Japanese art at the nearby Museum of Fine Arts, Boston, in addition to slides. The discussion will include both the social context and function of Japanese screens.
- **Observation of conservators in the Asian conservation lab at the Museum of Fine Arts, Boston (MFA).** Ms. Kitagawa will help organize a visit to the MFA to talk to conservators of Asian art and gain a better understanding of their work. This will help Gardner educators appreciate what has been learned in the conservation treatment of *Grape Vines*.
- **Preparation of a teaching resource notebook, *Japanese Art in the Isabella Stewart Gardner Museum.*** Ms. Kitagawa will work closely with Gardner educators to create a resource that will address the needs and interests of target groups, including adults, children and teens in school and community partnership programs. The notebook will include a bibliography, useful maps and photographs.

After *Grape Vines* have been re-installed in September 2003, Mr. Nishio will bring the scale model to the Gardner and will demonstrate the folding screen to the Museum's teaching staff. The model screen and supporting materials will advance the Gardner's hands-on teaching methods, and will include a lightweight, durable case that will enable educators to transport it to schools and community centers. The screen itself is designed for ease of manipulation in demonstrations, and a range of materials such as wood, hand-made papers, lacquer and silk brocade will be provided for school groups to handle and examine.

Education staff will present the new curriculum on the art of Japanese screens to adjunct and volunteer teaching staff. Ms. Kitagawa will observe education staff teaching the pilot curriculum and will continue to be available for consultation and questions throughout the 2003-2004 school year as staff and volunteers incorporate the model into their teaching. The budget includes her consultation and planning time outside of the 12 hours of

formal staff training. Any necessary refinements will be made to the curriculum unit by the end of this school year.

In December 2003, a specially made conservation documentary video will be available to educators and student groups. During the conservation treatment period, staff members of the Nishio Conservation Studio will record the conservation treatment of *Grape Vines*, including close-ups of the screens before, during and after treatment. The video taped scenes will include each phase of the conservation as well as an interview with a Japanese art historian and an introduction to the traditional craft of conservation. The tapes will be edited with highlights into a 15-minute documentary with a digital non-linear master with narration, music and subtitles. The documentary video will help teachers explain the conservation process to student groups, and will also help introduce the subject of career opportunities in conservation.

2 WHAT ARE THE ANTICIPATED BENEFITS OF THIS EDUCATIONAL PROJECT?

The Japanese screen curriculum and collateral products will expand the Gardner Museum's dedication to teaching about conservation. In 1999 the Education Department published *Eyes on Art III: The Conservation of Art*. The guide leads teachers through the process of conservation and addresses larger questions concerning the value of cultural objects. The education component being proposed here will further strengthen this commitment by reaching younger audiences with hands-on, interactive learning techniques focused on conservation.

The new curriculum unit will also help to introduce and celebrate Asian art to participants in the Museum's *School and Community Partnership* programs, representing some of the city's most economically and culturally diverse neighborhoods. These partnerships provide an in-depth approach to art education that relies on careful collaboration between Gardner educators and classroom teachers, multiple visits to the Museum, classroom visits by Museum staff, and hands-on art-making activities. Museum educators will be able to use the curriculum, scale model and video in activities that take place both at the Gardner and in the school classroom or community center.

The Japanese screen curriculum will become a standard part of the Gardner's teaching offerings. After the curriculum has been tested by Museum educators and classroom teachers, the model and syllabus will be made available for docents who work with adult groups.

3. HOW DOES THE PROJECT BUDGET SUPPORT THE EDUCATION COMPONENT GOALS AND OBJECTIVES?

The detailed budget covers all expenses involved in developing a new curriculum unit focused on the Gardner's collection of Japanese screens. Costs were determined using estimates provided by the consultants. Estimates for staff time are based on the Education Department's previous experience with training and developing new curricula.

As a skilled conservator, Mr. Nishio's projected costs for the scale model and video have been carefully calculated, and his proposal includes delivering and demonstrating the model to the education staff. Likewise, Ms. Kitagawa's compensation rate is reasonable, given her level of expertise in developing appropriate content for the teaching unit and the audiences the Gardner seeks to serve. The budget includes her consultation and planning time outside of the 12 hours of formal staff training.

4. WHAT ARE THE QUALIFICATIONS AND RESPONSIBILITIES OF THE PROJECT PERSONNEL?

Margaret K. Burchenal, Curator of Education

A nationally recognized arts educator, Ms. Burchenal was named Curator of Education in 2000. Her 20 years of experience include developing and implementing education programs at the Museum of Fine Arts in Boston, the

Portland Museum of Art, and the Philadelphia Museum of Art. She earned her M.A. in art history from Harvard University and recently completed a four-year term on the board of the National Art Education Association. At the invitation of the J.P. Getty Education Department, she spent three months (July–September 2001) as a guest scholar at the Getty Research Institute working on the question of how to define and assess multiple visit learning in art museums. Ms. Burchenal is a frequent contributor to professional journals and workshops, and has presented at numerous national conferences. Ms. Burchenal is skilled at developing and implementing collaborations and innovative projects, and will coordinate the completion of the Japanese screen curriculum with the consultants and Gardner Museum education staff.

Anne Kitagawa, Assistant Curator of Japanese Art, Arthur M. Sackler Museum
Ms. Kitagawa is an experienced historian of Japanese art who, having worked both at the Museum of Fine Arts, Boston and at Harvard University's Sackler Museum, is familiar with the body of Japanese art in Boston museum collections. Her extensive experience teaching about Japanese art to teacher and students began at the Art Institute in Chicago. She is a lively, engaging teacher with a strong scholarly and curatorial background.

Yoshiyuki Nishio, Nishio Conservation Studio
A highly respected conservator, Mr. Nishio specializes in the treatment of Japanese and Chinese screen and scroll paintings. He has worked in this field for more than forty years in Japan and in the United States at numerous private and institutional conservation laboratories including the Museum of Fine Arts, Boston and the Freer and Arthur M. Sackler Galleries at the Smithsonian. Mr. Nishio is responsible for creating the scale model of a six-fold screen, and for creating a documentary video of the conservation process. As an experienced conservator, he is in the best position to understand what key aspects of the conservation treatment should be conveyed to a general audience. His first-hand knowledge of all aspects of Japanese screens makes him uniquely qualified to produce effective teaching tools for a wide-ranging audience.

Johnetta Tinker, Director of Community Programs
Johnetta Tinker joined the Gardner staff in 1993. She received her M.F.A. in Art Education from Boston University in 1979, and has over 25 years of experience as a teacher, museum educator and artist working at institutions including the Museum of Fine Arts, Boston, the Advent School, Boston, and the State University of New York at Stony Brook, Long Island, NY. Ms. Tinker is a published illustrator and the recipient of selected honors and awards recognizing her dedication to art and community. Ms. Tinker will coordinate the development and implementation of the new curriculum unit for the Gardner's community partners.

Linda Graetz, Director of School and Teacher Programs
Linda Graetz joined the Gardner Museum staff in July 1995. She received her Masters in Educational Psychology from the University of Houston and has 20 years of museum education experience working at institutions including the Houston Museum of Fine Arts, the Children's Museum of Houston, the Museum of Fine Arts, Boston, and the Science Discovery Museum in Acton, MA. Ms. Graetz has presented at numerous national conferences, and her writings on the subject of art education and museum teaching have been published in several leading journals. Ms. Graetz will coordinate the development and implementation of the new curriculum unit for the Gardner's school partners.

Judith N. Murray, Director of Visitor Learning
Judy Murray came to the Gardner in September 2001. She formerly directed the Gallery Instructor Program at the Museum of Fine Arts, Boston. A skillful teacher herself – and a strong advocate for interactive teaching– Judy is adept in helping others develop effective teaching strategies. In her new role at the Gardner, Judy will help our current Museum Teachers (adjunct teaching staff) maintain high standards of excellence in their teaching. In addition, she will restructure our current Information Desk program so that these volunteers spend more time interacting with the public in the galleries. This project will give her the opportunity to help adjunct teaching staff and volunteers gain a better understanding of Asian art in the Gardner collection in general, and the *Grape Vines* screens in particular.

L.C. Bates Museum (Sample Education Component)

Hinckley, Maine

Project Type:	Treatment
IMLS Education Award:	$3,110
Total Project:	$12,356
Museum Budget:	$102,664

Project Summary:

$9,246 to treat seven Charles D. Hubbard dioramas and document the process and plan the conservation of the Museum's remaining 21 dioramas. $3,110 to disseminate information about diorama conservation via a newsletter article which will be available at the museum for the general public. Also, a public education program, an interpretive panel exhibit and docent script about the issues of conservation but focusing on diorama conservation will be developed.

L.C.Bates Museum
Conservation and Preventive of the Hubbard Diorama
Educational Component – Narrative Questions

1.What is the design of the Educational Component? The **goal** of the educational component is to educate the Museum staff, board and volunteers, Good Will-Hinckley Museum Studies Students, the Maine museum community, teachers and visiting students and our rural Maine museum audience about the importance of conservation and preservation work, specifically the work of conserving the Charles D. Hubbard dioramas. The project activities will teach about the treatment process for the benefit of museums with similar conservation issues and our museum audience. It is anticipated the project will increase public understanding of conservation issues including: the elements of deterioration, conservation practices, importance of supporting conservation work and the role of the conservator. The Hubbard Diorama Treatment project will be used to exemplify the conservation issues and provide a concert example for rural audiences often new to conservation practices. The project program activities will include activities designed to be accessible to varied audiences, from Museum peers to at-risk Good Will-Hinckley youth. This program will compliment a present Museum program, *Preserving Mounted Fauna Collections: Preservation and Safety Considerations.*

The objective is to develop and implement *Conservation and Preservation of the Hubbard Dioramas,* an educational project that will present the most accurate information on the safe preservation of natural history dioramas and their elements and environments; mounted animals, paintings, cases, monitoring equipment and lighting. The project will outline the steps and process for the conservation of the Hubbard dioramas and the role of the object conservator, Ron Harvey and the Art Conservator, Tom Branchick.

The plan is to reach varied audiences through the following well researched education activities.

1.An *article in the Maine Archives and Museums newsletter*, written by object conservator Ron Harvey, that will serve as a guide to other museums and historical organizations throughout the state that contain natural history collections in historic settings.

2. Ten *thousand copies of the object conservator's article text* will be printed as a museum note and available free to visitors to the museum for the public and greater museum community.

3. Using Mr. Harvey's article and expertise and the Habbard Diorama Treatment project portfolio and slide documentation that will be produced during the project activities, the project educator will *develop an hour long museum conservation program*. This program will be presented first at the re-opening of the dioramas in June 2003 and after that be available to groups through both in-house and outreach programming. It will become a part of the Good Will-Hinckley Museum Studies students curriculum, be used for Girl Scout badges programs, Museum volunteers training and to support fund raising for the additional dioramas. The program will include slides, tools, equipment, assessment reports and if presented in the museum a tour of the preserved dioramas. The program will illustrate the conservation issues, the steps to their solution and the outcomes. The museum studies student program will address *Maine Learning Results*. It will include pre and post visit materials for educators.

4.A short *docent script* will be written by the project educator. The informative diorama conservation script will be used guiding visitors through the diorama collection.

5. *Two 30 " by 40" interpretative exhibit panels* with photographs and text exhibit explaining the diorama treatment project will be placed in the bird room that contains the treated dioramas. These panels will be created by museum staff, museum studies students and volunteers.

6. In spring 2003, the Museum will host a late spring *MAM workshop, Diorama Cconservation* using this project and its educational program to illustrate the conservation process from assessments and grant writing to completion.

The **object conservator**, Ron Harvey will spend 3 days researching and writing the MAM newsletter article text which will also be the basic outline for the educational programs. The **educational consultant,** Cindy Eccher will spend 48 hours developing and testing the museum the hour long program. This includes writing a script outline, compiling slides and hands-on materials and tools, aligning the student program to Maine Learning Results, training presenters, and working with the project director to assemble needed materials and tools, box the program for travel to organizations and schools and finalize the program. The **project director**, Deborah Staber will arrange all activities include submitting the article to MAM and other media, assist the educator as needed, organize and advertise the program presentations, arrange the program and outside evaluations. She will spend about 10% of her time for 10 months, Jan 2003-Oct 2003 on the project activities, assisting consultants, on program scheduling, presentations and docent training. She will be responsible for developing and making the panel exhibit with assistance of the educator and conservators text. The **project evaluator**, Julia Hunter will view the Panel exhibit, program and participants surveys to examine the strengths of the educational component and to suggest modifications. She will spend ½ day viewing the program and article etc. and ½ day writing her evaluation. All evaluation materials will be used to self-assess and improve the program's future presentations. Also, **L.C. Bates Museum volunteers including Board Members** will spend over 100 hours assisting the educator, evaluating the project, in training and presenting programs. **Museum Studies Students** will spend time assembling the exhibit panels, assisting the educator/consultant, in programming training sessions, assisting with programs or as participants in programs.

The schedule of completion is appropriate base on the museum's past experience in developing over 30 public programs and the time the consultants feel they will need to complete their work on the project. The educational program is designed to be completed by and available to present or distribute at the reopening of the dioramas in June 2003.The MAM article will be submitted to the summer 2003 newsletter.

2. What are the anticipated benefits of this educational project?
In rural Maine there is very limited access to information about conservation for the general public. The educational program activities will bring on-going educational information about collection preservation to our community. This program will inform the general public, educators, and other museums about the needs and process of object conservation. It will present our Hubbard diorama project, but encourage participants to look for applications of the information in their own museums, collections, and organizations. The outcomes to our general audience will be the program, an informative exhibit panel and free copies of the object conservators article that will be available at the museum for at least 3 years. It is anticipated that over 2,500 people will participate in the program during the first year and many thousands more will experience the decent talk and panel exhibit.

The results of the educational component are expected to be long term and on-going. After the initial presentations of the program and publishing of the article in June 2003, copies of the article and the program presentations will be available for the public. The program will be part of the museums direct mail and through our web sit, which will also have a page about the dioramas, advertised offerings of educational programs available for schools and groups by appointment. Future presentation will be supported by the Museum's modest presentation fees of $30.00 for an outreach program and $20.00 for an in-house program. The program materials and script will be flexible, in order to maximize accessibility to a varied audience. The presentations might be of interest to MAM members, Maine Trappers Association, Maine Taxidermy Club, Maine Sports Associations, Maine nature and Audubon clubs, Scouts, Three area adult education programs, Museum Studies students and environmental interpretation studies classes at local colleges, art classes, and school classes. It will be of particular importance for Maine school groups K-12 because it will provide a resource for meeting the mandated Maine Learning Results curriculum requirements for public schools.

In 2003 to 2005, the Museum hopes to raise additional funds to treat the remaining 21 dioramas, some that are very large (35' by 12') and include endangered and extinct animals. We anticipate the program will encourage service groups and potential donors to support the conservation of these dioramas. In addition, the program will be used to train new museum volunteers and advisory board members about conservation.
Evaluation: This project's programs and workshop will be evaluated subjectively by all participants through written forms generated by the educator consultant and project director, and evaluated by members of the

Museum advisory board. The program will be evaluated objectively by recording number of participants and educator referrals and repeat visits. An outside expert, Julia Hunter, Registrar of the Maine State Museum, will assess the program and written materials. The Museum Studies students' knowledge of and attitude toward conservation treatments will be surveyed prior to their participation in the program and at the end of the program to assess the change in their knowledge and attitude toward conservation.

3.How does the project budget support the educational component goals and objectives? For developing a long term program with potential to reach diverse audiences, these are judicious costs. The costs are reasonable and appropriate because they are based on similar past program development experiences and on estimates of costs for materials and copied article that have been developed after receiving and reviewing estimates from at least three sources. The costs of conservation and educational consultants are based on their estimates, which in turn are based on their work on similar projects. As an educational museum The L.C.Bates Museum staff is repeatedly developing programs for the public, and is familiar with the time involved to create an interesting and informative public or volunteer training program, and with the kinds of visual materials needed to inculcate the information, encourage audience participation, and address different learning styles. The materials, slides and copying costs are based on estimates from the SBS Copy Center, conservation suppliers catalogues and Charette Art Supply Catalog for the mat board, foam core and mounting materials for the interpretive panel.

Much of the budget's match is in-kind work of the staff and museum volunteers, and will be done when museum activities are light in winter and early spring. The museum will provide hands-on materials for the program such as samples of safety equipment, conservation tools and brushes and consultant educator and evaluation surveys. Funds from the State Dept of Education three year grant will support the costs of the small panel exhibit materials that will be put assembled by 3 Good Will-Hinckley Museum Studies Service Learning youth and a volunteer supervision for the at-risk students as they dry mount photos and graphics and cut the panel. They will receive high school credit for this museum studies project. The Good Will-Hinckley Museum Studies students and museum volunteers who will present the program and docent tours will be a low-cost resource for the Museum. Although not part of this grant time period, continued presentations of the Diorama Treatment program will be supported by regular, low cost museum program fees.

4.What are the qualifications and responsibilities of the project personnel? Conservator: Ron Harvey, the object conservator for the project will write an article for MAM newsletter about the project. This will serve as the script outline for the educational program. He has successfully assisted the Museum in developing a brochure and program on safety issues with mounted collections and in presenting metal conservation workshop. He has published numerous articles on collections care and projects, (See his attached Resume) and has extensive experience in the field of conservation. He worked with museum and public organizations for many projects and understands the information they need. For nine years he served as head conservator at the Milwaukee Public Museum. He has presented many papers at conferences for both conservators and museum staff and volunteers. He operates Tuckerbrook Conservation Lab in Maine. **Project Director:** Deborah Staber , L.C.Bates Museum Director has oversee the development of over 30 museum educational programs and exhibits. She has developed and promoted the Museum's education services and programs for diverse audiences. She is project director for the Good Will-Hinckley campus Museum Studies Program for at-risk youth. As such she has developed curriculum and attended and presented at state educational conferences which explore service learning. **Educational Consultant**: Cindy Eccher has successfully consulted with the museum for 8 years. During that time she has developed programming, developing an on-going program about the safety issues involved in handling mounted specimens, worked with student's service learning projects, written a docent training manual and trained volunteers. She holds a Masters Degree in Environmental Education, and a Bachelor of Science degree in Nursing. She has taught Environmental Pollution classes at Unity College. Her medical and teaching experience will aid her in the development of the Diorama Conservation Program. **Museum Volunteers**: Good Will-Hinckley museum studies students who have had experience in exhibit panel construction, dry mounting, etc. in the museum will build supports for the panel exhibit and ensemble the exhibit pieces. Museum volunteers are seasoned docents and program presenters who will learn, present and help evaluate the new on-going program. **Profession Evaluator**: Julia Hunter, Registrar at the Maine State Museum, where she has also serve as Curator of Fine Arts, Graphic Arts and Archives; Manager of Cultural Resources Information Center[CRIC}; Outreach and Publications Coordinator; and Museum Educator.

Preservation Society of Newport County (Sample Education Component)

Newport, Rhode Island

Project Type:	General Survey
IMLS Education Award:	$10,000
Total Project:	$58,880
Museum Budget:	$15,000,000

Project Summary:

$48,880 will be used to conduct a general conservation survey of the Society's extensive collection of objects and the interior decorative surfaces of 10 historic house museums. $10,000 will be used to present a series of four lectures and four workshops entitled, "Preserving Your Own Historic Home," to assist the public in preserving old and/or historic buildings using the conservation practices and procedures developed by the survey.

1. What is the design of the education component?

- **Project activities in detail, goals and objectives of component and how they will be met.**

The education component for this project will be a series of four lectures and four hands-on workshops on the preservation of buildings, their interiors and furnishings. The series, entitled "Preserving Your Own House," will be a collaborative effort co-sponsored by The Preservation Society of Newport County (Society) and the Newport Restoration Foundation, both non-profit organizations with expertise in the preservation of historic buildings in Newport County. The objective of this annual educational series will be to assist the local and regional community members in the preservation and restoration of their own historic properties by using the Preservation Society's historic house museums as models of conservation practices and procedures, as represented by the general conservation survey's assessment.

The Issac Bell House, an 1883 Stanford White-designed shingle-style house of 12 rooms, will be a focal point for the conservation study offering participants hand-on experience with this National Historic Landmark building in the Society's collection of historic properties. The Issac Bell House is presented as an ongoing preservation *work-in-progress*. The conservation of building materials in stone, brick, and wood, and the interior architectural elements and finishes, such as gilding, metal work, rattan, paper, stenciling and plasterwork, provide participants with first-hand experience of conserving materials they would find in many other old and historic building.

A second piece of this education component is the development of a permanent page on our web site based on the theme of *Preserving Your Own House* with related education materials for our membership's and the general public's use. This is an area where we could highlight the funding collaboration of the Institute of Museum and Library Services in making this information available to the public. This site will be designed to provide information, references and links to historic building conservation for the general consumer.

For example, the site would highlight the importance of an architectural investigation — understanding how a building has changed over time and assessing levels of deterioration — as the critical first step towards planning an appropriate treatment. Whether as a home owner making sympathetic repairs, a craftsman or contractor replacing damaged or missing features, or a conservator reconstituting wood or restoring decorative finishes, some type of investigative skill was used to recognize and solve an architectural question or explain a difficult aspect of the work itself. To date, very little has been written for the layman on the subject of architectural investigation. We will strive to provide the knowledge to the general public, as in this example, of the importance of meticulous planning prior to work on our irreplaceable historic properties and cultural resources. The site will also provide education on the treatment of various construction materials and architectural elements, the conservation of historic objects and decorative elements, and links to other related sites.

- **Amount of time staff will spend on the project**

Lectures, hands-on workshops and tours will be the basis for providing the audience with information gathered from the conservation survey. These educational offerings will be conducted by historic preservation carpenters, stone masons, and architectural and furniture conservators. The curriculum for the education component will be developed by the Architectural Historian/Director of Academic Programs, Curator, Chief Conservator of the Society together with the Executive Director of the Newport Restoration Foundation. The series will be managed by the Director of Academic Programs at the Society with two assistants. Brochures and public relations developed will include two staff members in the Society's Communications and Marketing Department and two staff members from the Society's Special Events Department. The Education web page will be developed collaboratively over the course of 12 months and posted after the completion of the education series. Materials/Articles/References of the web page will be developed by the faculty of the "Preserving Your Own Home" series, and the information consolidated into a format that would allow for the web page development to be translated into a project that could be implemented by interns in the Education, Conservation and Marketing Departments at the Society.

Timeline:

- Lecture/Workshop Curriculum Development: 5 months by faculty
  (Faculty = The Society's Architectural Historian/Director of Academic Programs, Curator, and Chief Conservator, as well as the Executive Director of the Newport Restoration Foundation)
- Lecture/Workshop Marketing Brochure Development and Program Registration: 3 months total by staff
  (Staff = The Society's Director of Academic Programs, 2 Academic Program Assistants, 2 Communications and Marketing Assistants)
- Lecture/Workshop Execution: 4 months (one per month) by staff
  (Staff = The Society's Historic Preservation Carpenters, Stone Masons, and Architectural & Furniture Conservators)

Web Page Development: 12 months and ongoing by faculty
(Faculty = The Society's Architectural Historian/Director of Academic Programs, Curator, and Chief Conservator, as well as the Executive Director of the Newport Restoration Foundation)
Web Page Execution: 3 to 5 months by interns
(With oversight by the Society's Director of Academic Programs, Director of Marketing, Chief Conservator, and others as appropriate.)

Why your schedule of completion is appropriate

Total project schedule is for completion in a 15- to 17-month timeframe. This timeline has been developed to be consistent with the standards of the Society's extensive educational, special events and marketing departments planning guidelines and activity levels.

- **Any intended products**

Products include curriculum development and related educational materials that may be used on an annual basis. An educational web page is a specific component of this request, and its development will be ongoing for the society. Articles about the development of this component page of our website will be featured in the Newport Gazette, a publication of The Preservation Society of Newport County. This publication is sent out three times each year to an extensive membership and donor constituency.

How your education component relates to your conservation component

The education series will be the forum for presenting the Preservation Society's conservation survey to the local community and general public at large. The series is dedicated to developing a greater awareness of professional conservation practices among the homeowners and building contractors of Newport County and any other interested individuals.

2. What are the anticipated benefits of this educational project?

Relevance to the museum's audience

To provide the Preservation Society's membership and the local community of Newport County residents with a forum for learning about basic conservation philosophy and methods in order to be responsible stewards of their own properties. As leaders in the field of historic house preservation, the Preservation Society and the Newport Restoration Foundation hope to develop a strong preservation ethic among the members of Newport County since all of Newport and its environs are of landmark significance.

The outcomes of this project for your museum's general audience

The education component will be an annual forum for sharing the most current information on the conservation of buildings, interiors, and all types of media, such as wood, plaster, ceramics, metal, paper and textiles. As stewards of historic properties large and small, the homeowners of Newport County each contribute to the historic character of the community, Sharing expertise in conservation by the County's leading preservation organizations will ensure the responsible preservation of the community as a whole.

- **How the benefits will be used by your museum and disseminated to your audiences**

The education component will be held annually, and, thus, will be a continuous service to disseminate information to the community. Transcribed lectures and procedures for conservation will be available at the Preservation Society's library and on the newly established page on our web site, which is open and available to all.

Potential for continuing the project after the planning period or after the initial implementation stage

The Preservation Society and Newport Restoration Foundation are committed to the education component as an annual series to benefit the community. The Society is committed to providing consumer-oriented information on our web site regarding historic home restoration and conservation.

3. How does the project budget support the education component goals and objectives?

The costs of developing the curriculum, designing and printing brochures, and implementing the series were determined from current education series costs at the Preservation Society.

The costs of developing the web site page are reasonable estimates based on the projected number of hours for materials and site development. These costs are in line with the Society's prior budget figures for similar activities.

4. What are the qualifications and responsibilities of the project personnel?

Primary Faculty

John Tschirch has an M.A. in Architectural History and Historic Preservation from the School of Architecture at the University of Virginia. He has worked as Director of Academic Programs and Architectural Historian for the Preservation Society for 12 years, and is a specialist in historic houses in Europe and America of the 18th and 19th centuries. He has presented conference papers for UNESCO and Yale University, published on historic houses in exhibition catalogues, peer reviewed journals, and contributes to Preservation Society publications. He is also a Research Fellow in Art History at Boston University.

Charles Jeffers Moore trained as a furniture maker, and for three years was Chief Carpenter of the National Cathedral in Washington, D.C. Mr. Moore has been the Conservator for The Preservation Society of Newport County for the past 10 years. He graduated from Roger Williams University with a degree in Historic Preservation and is currently one of the five Fellows in a Master's degree program administered by the Smithsonian Institution's Conservation Analytical Laboratory.

Pieter Nicholson Roos was appointed the Executive Director of The Newport Restoration Foundation in January of 1999. He received his B.A. (1982) in Anthropology from Drew University in Madison, N.J., and his M.A. (1989) in History/Museum Studies from the Cooperstown Graduate Program at the State University of New York at Oneonta. Mr. Roos served as Supervisor of Historic Sites for the Morris County Park Commission from 1989 to 1993, and was The Newport Historical Society's Director of Education from 1993 to 1998. He is presently engaged with The Newport Restoration Foundation's preservation projects on architecture of the Colonial and Federal periods, and "Rough Point", the estate of the late Miss Doris Duke.

St. Louis Art Museum (Sample Education Component)

St. Louis, Missouri

Project Type:	Treatment
IMLS Education Award:	$10,000
Total Project:	$23,500
Museum Budget:	$24,141,314

Project Summary:

$26,770 will be used to treat a 13th century Spanish polychrome sculpture of Christ in Benediction, the Museum's only example of medieval Spanish sculpture, which is seldom represented in American museum collections. $10,000 will be used to create a Curriculum Activity Kit which will be loaned free of charge to K-12 teachers and to develop two Teacher Workshops to introduce and explore conservation issues.

THE SAINT LOUIS ART MUSEUM

Education Component Narrative

1 WHAT IS THE DESIGN OF THE EDUCATION COMPONENT?

Project activities: The Saint Louis Art Museum (SLAM) requests funding to research and prepare a Curriculum Activity Kit on polychrome sculpture for use by teachers and schoolchildren. The kit will introduce and explore conservation issues such as: How do we understand how objects were made and how they look? How do various methods of conservation analysis illuminate the historical context of an artwork? How do conservators preserve and restore painted wooden sculpture? What are the possibilities and limitations of restoration?

The kit will focus on five polychrome sculptures in the Museum's permanent collection: an early 16th century Flemish *Madonna and Child*; a Dutch *Entombment of Christ*, c. 1500; a 12th century *Throne of Wisdom Madonna*; a *Madonna and Child* from Ulm, c. 1500, and the 13th century Spanish *Christ in Benediction* that is the subject of SLAM's current IMLS Conservation Project request. Conservation and curatorial staff already have the necessary information on the first four of these sculptures, as a result of previous conservation activities. With the addition of information that will come out of analysis and treatment of the *Christ in Benediction*, we will be ready to undertake the educational project.

Once Objects Conservator Suzanne Hargrove and Dr. Judith Mann, Curator of Early European Art, have processed the information, they will collaborate with Barbara Decker, Head of Teacher Services, who will create the kit and oversee production of 350 copies. Activities will include production of slides, 8 x 10 posters, interdisciplinary teaching materials tied to Missouri standards for grades K-12, information sheets on the objects as well as conservation terms and methods, and a bibliography.

Goals and objectives: The Museum's goal is to help our audiences explore works of art through multiple "lenses" and on many different levels. The immediate objective is to create a Curriculum Activity Kit for free loan to K-12 educators, and for purchase, that will focus on polychrome sculpture through the conservation "lens."

Amount of time staff and consultants will spend on the project: No consultants will be required. Staff time: Barbara Decker, Head of Teacher Services, 40 days; Judith Mann, Curator of Early Euorpoean Art, 5 days; Suzanne Hargrove, Objects Conservator, 5 days; Carlene Fullerton, Coordinator of Teacher Services, 180 hours; Senior Administrative Assistant, 20 hours; Research Assistant. 60 hours.

Why the schedule of completion is appropriate:

Preliminary work (such as photographing the crating and packing) on this educational component can begin when the grant begins, but most project activities depend upon the completion of the conservation project..

Intended products: The first product of this component will be 350 copies of the Curriculum Activity Kit described on page 1. It will be similar to the extremely successful kit on George Caleb Bingham and the Westward Movement that the Museum produced in 1999. The Museum's Teacher Services will offer two evening Teacher Workshops based on the kit. We expect that the work accomplished for the kit will also provide the basis for delivering the information through other formats, such as the Museum's website and in text information in the galleries. Materials developed for the kit can also be folded into educational programs and materials that focus on medieval art in general.

How the education component relates to the conservation project: With this educational component, the Museum seeks to inform its audiences – beginning with K-12 teachers and students – about the importance of conservation, how conservation analysis provides an additional strategy for understanding art, and what issues must be considered in conservation practice.

2. WHAT ARE THE ANTICIPATED BENEFITS OF THIS EDUCATIONAL PROJECT?

Relevance to the Museum's audience: For teachers of K-12 students, this project offers an opportunity to use the conservation of medieval art in interdisciplinary studies, including history, science, language, visual art, and mathematics (measurement).

Outcomes of this project for the Museum's general audience: Museum lecturers, educators and docents find that the public is curious about conservation, but that they have little information. As an institution, we have had no ongoing format for discussing conservation issues. This kit and later products based on it will provide our first systematic exploration of conservation for our general public.

How the benefits will be used and disseminated: The Curriculum Activity Kit will be available for free loan to teachers through the Museum's Resource Center and its five Satellite Resource Centers (Belleville, IL and St. Joseph, Cape Girardeau, Springfield, and Lebanon, MO). It will also be available for purchase.

Potential for continuing the project: The kit will remain available through the Museum's Resource Center and its satellites for the indefinite future.

3. HOW DOES THE PROJECT BUDGET SUPPORT THE EDUCATION COMPONENT GOALS AND OBJECTIVES?

How the project costs were determined: Costs for producing the kit are based on actual costs of our recent George Caleb Bingham curriculum kit. Honoraria are based on current Museum honoraria.

Why the costs are reasonable and appropriate: Costs are based on actual amounts from reliable suppliers.

Origin and relevance of project match: In-kind match is based on actual current salaries, wages, and fringe benefits.

Cost factors in selecting personnel, materials, equipment, or scheduling: The costs for this project represent the expense of creating a high-quality curriculum kit, based on sound conservation theory, analysis, and practice, that teachers will be able to use for years.

4. WHAT ARE THE QUALIFICATIONS AND RESPONSIBILITIES OF THE PROJECT PERSONNEL?

Barbara Decker has been Head of Teacher Services at the Saint Louis Art Museum since 1993 Her previous experience in St. Louis includes positions as Director of Programming at Craft Alliance, Head of Fine Arts and Gallery Director at Logos School, and teaching positions at many area colleges and schools. Ms. Decker holds B.F.A. and M.F.A. degrees from Carnegie Mellon University.

Suzanne Hargrove, Head of Objects Conservation at the Saint Louis Art Museum, graduated from the State University College at Buffalo with an M.A.C. certificate for advanced study in conservation. She completed her internship at The Museum of London, and has been a staff member in the Objects Conservation Department at The Saint Louis Art Museum since 1984. Ms. Hargrove will stabilize the sculpture prior to shipment. She will oversee packing and transport of the artwork, and will monitor and consult on the treatment of the sculpture.

Judith Mann is Curator of Early European Art. She holds a B.A. from Mount Holyoke College, and M.A. and Ph.D. degrees from Washington University. Dr. Mann has authored major articles on Guido Reni, Caravaggio, and Artemisia Gentileschi, as well as catalogues of the Museum's collection of medieval art and its holdings in 17th and 18th-century Italian paintings. She has taught baroque art as well as the history of women artists, and is currently preparing a monograph on Artemisia Gentileschi for Phaidon Publishers.